

APPENDIX J

**REMEDIAL ACTION PLAN AND DESIGN REPORT, IR SITE 7
(WEST BASIN) DREDGING PROJECT, PORT OF LONG BEACH,
CA, DATED APRIL 2009 BY ANCHOR ENVIRONMENTAL, LLC**

REMEDIAL DESIGN AND REMEDIAL ACTION WORK PLAN

IR SITE 7 (WEST BASIN) DREDGING PROJECT PORT OF LONG BEACH, CALIFORNIA

Prepared for

The Port of Long Beach
925 Harbor Plaza
Long Beach, California 90802

Prepared by

Anchor Environmental CA, L.P.
28202 Cabot Road, Suite 425
Laguna Niguel, California 92677

April 2009



Table of Contents

1	INTRODUCTION	1
1.1	Project Description and History	1
1.2	Cleanup Areas and Anticipated Remedial Actions	3
1.3	General Description of Remedial Action	7
1.3.1	AOEC-A and AOEC-C	7
1.3.2	AOEC-E	8
1.3.3	AOEC-F and AOEC-G	8
1.4	Applicable or Relevant and Appropriate Requirements	9
2	EXISTING CONDITIONS	11
2.1	Physical and Chemical Conditions	11
2.2	Surrounding Land Use	13
2.3	Hydraulic Conditions	13
2.4	Geotechnical and Structural Conditions	14
2.5	Potential for Site Recontamination	15
3	DREDGE AND DISPOSAL PLAN	16
3.1	Anticipated Equipment and Assumptions	17
3.1.1	Production	17
3.1.2	Dredging Limits	19
3.1.3	Placement of Sediment Within the Pier G Slip Fill Site	19
4	CONSTRUCTION SCHEDULE AND SEQUENCING	21
5	POTENTIAL CONSTRUCTION IMPACTS AND BEST MANAGEMENT PRACTICES	23
5.1	Effects of Resuspended Sediments Due to Dredging Impacts	23
5.2	Potential Short-term Water Quality Impacts	24
5.2.1	Water Quality Impacts at Point of Dredging	25
5.2.2	DREDGE Model Input	25
5.2.3	DREDGE Model Results	27
5.2.4	Prediction of Water Quality Impacts at Point of Disposal	28
5.2.5	Prediction of Spread of Placed Sediment	29
5.2.6	STFATE Model Input	30
5.2.7	STFATE Modeling Results	30
5.2.8	Rehandling over the Containment Berm	34
5.2.9	Dredge Residual Management	35
5.2.10	Post-dredge Residual Expectations	35
5.2.11	West Basin Residual Analysis Results	36
5.3	Contractor Controls and Best Management Practices	37
5.3.1	Operational Controls	37
5.3.2	Specialized Equipment	38
5.3.3	Water Quality Monitoring	38
5.3.4	Post-dredge Monitoring	39



Table of Contents

5.3.5	Management of Dredging Residuals	40
5.4	Long-term Effectiveness of Disposal Location.....	40
5.4.1	Model Inputs and Assumptions	41
5.4.2	Model Results	43
6	CONTINGENCY MEASURES.....	44
6.1	Confirmation of Sufficient Sediment Removal	44
6.2	Contingency Actions for Short-term Water Quality	45
7	CONCLUSIONS	46
8	REFERENCES	47

List of Tables

Table 1-1	West Basin Sediment Management Objectives
Table 2-1	Summary of Total Solids and Metals in AOEC-A 01 and AOEC-A 02 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels
Table 2-2	Summary of Total Solids and Metals in AOEC-A 03 and AOEC-A 04 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels
Table 2-3	Summary of Total Solids and Metals in AOEC-A 05 and AOEC-A 06 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels
Table 2-4	Summary of Total Solids and Metals in AOEC-A 07 and AOEC-C East 01 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels
Table 2-5	Summary of Total Solids and Metals in AOEC-C East 02 and AOEC-C East 03 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels
Table 2-6	Summary of Total Solids and Metals in AOEC-C East 04 and AOEC-C East 05 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels
Table 2-7	Summary of Total Solids and Metals in AOEC-C East 06 and AOEC-C East 07 and a Comparison to Published Effects Range Low and Effects Range Median



Table of Contents

	Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels
Table 2-8	Summary of Total Solids and Metals in AOEC-C East 08 and AOEC-C East 09 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels
Table 2-9	Summary of Total Solids and Metals in AOEC-C West 01 and AOEC-C West 02 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels
Table 2-10	Summary of Total Solids and Metals in AOEC-C West 03 and AOEC-C West 04 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels
Table 2-11	Summary of Total Solids and Metals in AOEC-C West 05 and AOEC-C West 06 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels
Table 2-12	Summary of Total Solids and Metals in AOEC-C West 07 and AOEC-C West 08 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels
Table 2-13	Summary of Total Solids and Metals in AOEC-C West 09 and AOEC-C West 10 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels
Table 2-14	IR Site 7 – West Basin Soluble Threshold Limit Concentrations Chemistry Results
Table 3-1	Estimated Dredge Sediment Volumes
Table 5-1	Summary of Physical and Chemical Analysis of IR Site 7 Project Sediment Elutriates and Site Water and a Comparison to California Ocean Plan Water Quality Objections
Table 5-2	Input Parameters Used in DREDGE Modeling
Table 5-3	Key Input Parameters Used in STFATE Modeling
Table 5-4	Estimated Residual Layer Thickness
Table 5-5	Sediment Management Objective Limits and Calculated 95 Percent Upper Confidence Limits
Table 5-6	Summary of Physical Input Parameters for Chemical Isolation Modeling
Table 5-7	Summary of Chemical Input Parameters for Chemical Isolation Modeling
Table 5-8	Summary of Chemical Isolation Layer Modeling Steady-state Results Under Nominal Seepage Velocity Scenario



Table of Contents

List of Figures

Figure 1-1	Project Vicinity Map
Figure 1-2	Project Location and Overall Site Plan
Figure 2-1	Weston 2007 Sediment Sampling Locations
Figure 3-1	Plan – Typical Dredging Plan View for AOEC-C West (Draft)
Figure 3-2	Section – Typical Dredging Cross Section for AOEC-A (Draft)
Figure 3-3	Section – North Slip Fill Closure Dike
Figure 5-1	Comparison of Total Suspended Sediment Data Reported for Various Dredging Operations to Potential Effects Levels Reported for a Variety of Marine and Estuarine Species
Figure 5-2	AOEC-A at 48 Feet Depth Total Suspended Solids as Predicted by DREDGE
Figure 5-3	AOEC-A at 55 Feet Depth Total Suspended Solids as Predicted by DREDGE
Figure 5-4	AOEC-C East 45 Feet Depth Total Suspended Solids as Predicted by DREDGE
Figure 5-5	AOEC-C East at 48 Feet Depth Total Suspended Solids as Predicted by DREDGE
Figure 5-6	AOEC-C West at 35 Feet Depth Total Suspended Solids as Predicted by DREDGE
Figure 5-7	AOEC-C West at 49 Feet Depth Total Suspended Solids as Predicted by DREDGE
Figure 5-8	Total Deposited Material Thickness as a Function of Distance from Dump Location for AOEC-A
Figure 5-9	Total Deposited Material Thickness as a Function of Distance from Dump Location for AOEC-C West
Figure 5-10	Concentration of Total Suspended Solids as a Function of Distance from Dump Location for AOEC-A
Figure 5-11	Concentration of Total Suspended Solids as a Function of Distance from Dump Location for AOEC-C West

List of Appendices

Appendix A	Draft Construction Plans for Dredging of West Basin (Provided on CD) Prepared by KPFF Consulting Engineers
Appendix B	Draft Construction Plans for the Development of the Pier G Slip Fill Site (Provided on CD) Prepared by Moffatt and Nichol
Appendix C	Review and Description of Best Management Practices
Appendix D	Expected Water Quality Monitoring Requirements
Appendix E	Development of Confirmatory Sampling Plan
Appendix F	Response to Comments



Acronyms and Abbreviations

ADDAMS	Automated Dredging Disposal and Alternatives Modeling System
AOEC	Area of Ecological Concern
ARARS	Applicable or Relevant and Appropriate Requirement
BMP	best management practice
BRAC	Base Re-alignment and Closure
CalEPA	California Environmental Protection Agency
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
City	City of Long Beach
CSTF	Contaminated Sediments Task Force
COEC	Chemical of Ecological Concern
cy	cubic yard
DDT	dichloro diphenyl trichloroethane
DTSC	Department of Toxic Substances Control
ERL	Effects Range Low
ERM	Effects Range Median
FS	Feasibility Study
GPS	global positioning system
HQ	hazard quotient
IC	institutional control
IR	Installation Restoration
KPFF	KPFF Consulting Engineers
LARWQCB	Los Angeles Regional Water Quality Control Board
LBNC	Long Beach Naval Complex
LBNS	Long Beach Naval Shipyard
LIFOC	Lease in Furtherance of Conveyance
mg/L	milligram per liter
MLLW	mean lower low water
MND	Mitigated Negative Declaration
NAVSTA	Naval Station Long Beach
NCP	National Contingency Plan



Acronyms and Abbreviations

PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
Port	Port of Long Beach
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
SET	Standard Elutriate Test
SMO	Sediment Management Objective
STLC	Soluble Threshold Limit Concentration
TOC	total organic carbon
TSS	total suspended solids
TTLC	Total Threshold Limit Concentration
UCL	Upper Confidence Limit
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
Weston	Weston Solutions, Inc.
WDR	Waste Discharge Requirement



1 INTRODUCTION

This report describes remedial design elements and anticipated construction actions for the planned dredging and disposal of chemically impacted sediments from Installation Restoration (IR) Site 7, a portion of the Long Beach Naval Complex (LBNC) at the Port of Long Beach (Port), California. Remedial action is required to comply with an August 2007 Record of Decision (ROD; USEPA 2007) for the site.

Specific elements of this report include a description of the existing conditions within the Long Beach Harbor's West Basin (West Basin), a review of the dredge and disposal plan proposed to comply with the terms of the final ROD, a review of the anticipated construction schedule and project sequencing, a summary of the expected short-term impacts along with potential Best Management Practices (BMPs) that will be used to further minimize potential impacts, and contingency measures that may be needed if construction activities do not accomplish the necessary removal of impacted sediments.

The Port has separately prepared a California Environmental Quality Act (CEQA) Mitigated Negative Declaration (MND) document detailing the predicted environmental impacts anticipated for the selected remedy. That same information has been summarized in this document and was used to develop the recommended construction activity BMPs.

1.1 Project Description and History

IR Site 7 comprises approximately 700 acres of submerged land in the Port, which was formerly used by the U.S. Navy for training troops and maneuvering, anchoring, berthing, and maintaining vessels. It is adjacent to three former dry docks used by the U.S. Navy. Figure 1-1 provides the general location of the project site and Figure 1-2 provides a more detailed depiction of the specific areas of interest.

In 1935, the U.S. Navy negotiated a 30-year lease with the City of Long Beach (City) for developing the property into a naval facility. The U.S. Navy additionally purchased a strip of coastline along the southern portion of Terminal Island from the cities of Long Beach and Los Angeles in 1938. Beginning in 1938, the U.S. Navy operated the LBNC for naval and other marine activities, such as providing maintenance facilities for the berthing operations of tugboats, scows, and similar vessels. The LBNC provided logistical support for assigned

ships and performed work in connection with construction, conversion, overhaul, repair, alteration, dry-docking, and fitting out of ships.

During LBNC operation, various fuels, oils, and other organic and metal wastes were discharged into IR Site 7 and LBNC in general. From the early 1940s to the mid-1970s, drainage from various industrial areas, and from cleaning and processing tanks, was discharged into the West Basin, which was within the boundaries of the LBNC. It is believed that wastes were discharged through the storm drain system and from the flushing of dry docks. As a result, surface waters within the area received inputs of heavy metals, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). Over time, these contaminants accumulated in sediments in parts of the West Basin to levels predicted to cause ecological risks to the resident benthic communities.

After more than 50 years of service, the Naval Station Long Beach (NAVSTA) was closed on September 30, 1994, under the Base Realignment and Closure Act (BRAC) II. During this same year, the U.S. Navy initiated a comprehensive field sampling effort to support a Remedial Investigation (RI) of the West Basin's sediments (Bechtel 1997) following Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidance. Included in the RI were detailed ecological and human health risk assessments from potential exposures to site sediments. On September 30, 1997, Long Beach Naval Station (LBNS) was closed under BRAC IV. During this period, site ownership of the submerged land (except the 100-foot annulus) within the West Basin was formally reverted back to the Port.

The results of the RI were published in 1997 and concluded that no potential human health risks were posed by site sediments. The results did however conclude that ecological risks to benthic organisms residing in the IR Site 7 sediments could occur. As a result, a subsequent Feasibility Study (FS) was conducted to identify areas of potential ecological concern and possible remedial alternatives for managing these risks. The final FS was published in September 2003, which identified several areas for sediment remediation and selected dredging with on-site disposal as the preferred alternative. The final FS was later amended to accept off-site disposal as an equally effective alternative.

Pursuant to the terms of the Lease in Furtherance of Conveyance (LIFOC) between the City and U.S. Navy, the Port will implement the required response and corrective actions at IR Site 7. The Port subsequently entered into a Consent Agreement with the California Environmental Protection Agency (CalEPA), Department of Toxic Substances Control (DTSC), to establish the process and timetable for the Port's implementation of the remedy selected during the FS. This work is required to be conducted in a manner consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 Code of Federal Regulations [CFR] part 300 et seq.), as amended; California Health and Safety Code (Sections 6.5 and 6.8), as amended; and other applicable federal and state laws and regulations.

In September 2007, a ROD was prepared and executed by the U.S. Navy in order to accept the proposed remedies from the RI/FS. This Remedial Design and Remedial Action Work Plan and design report documents the Port's proposed actions for complying with the ROD as well as the Consent Agreement and LIFOC.

1.2 Cleanup Areas and Anticipated Remedial Actions

The FS identified, screened, and evaluated a range of remedial alternatives to reduce the potential for adverse biological effects estimated for benthic communities living in the chemically impacted sediments of IR Site 7.

In the FS, IR Site 7 was divided into seven Areas of Ecological Concern (AOECs) to account for variable conditions across the site and potentially different remedial alternatives available to address site contaminants within each area:

- AOEC-A is in the northeastern corner of the West Basin, alongside Pier T. It comprises approximately 15 acres and was found to contain elevated concentrations of chemical compounds in surface sediments. No sediment toxicity or benthic community effects were reported.
 - Note that AOEC-A originally extended along the entire northern portion of the West Basin during the RI phase, but was dredged by the Port to deepen the area for shipping berths; the contaminated sediments from this area were removed and managed in accordance with state and federal permits and requirements.

- AOEC-B is defined as the area between Pier 9 and Pier 11. It comprises approximately 80 acres and was found to contain elevated chemical concentrations in surface sediments. No sediment toxicity or benthic community effects were reported.
- AOEC-C is defined as the area between Pier 11 and Pier 15. It comprises approximately 62 acres and was found to contain elevated chemical concentrations. Sediment toxicity and adverse benthic community effects were reported for surface sediment.
- AOEC-D is defined as the area offshore of the tip of the U.S. Navy Mole and the entrance to the West Basin. It comprises approximately 13 acres and was found to contain one chemical compound slightly above the target screening level, low toxicity, and no benthic observed effects.
- AOEC-E is defined as the area beneath Pier 12 (i.e., Fuel Pier). It comprises approximately 5 acres and was found to contain elevated chemical concentrations and minor sediment toxicity, but no reports of adverse benthic community effects.
- AOEC-F is defined as the area beneath Pier 15. It comprises approximately 4 acres and was found to contain elevated chemical concentrations, but no sediment toxicity or adverse benthic community effects.
- AOEC-G is defined as the area beneath Pier 16. It comprises approximately 5 acres and was found to contain elevated chemical concentration and minor sediment toxicity, but no adverse benthic community effects.

The sediments within each AOEC were individually evaluated against a range of remedial action alternatives to determine the best mitigation measure for reducing potentially adverse biological effects. Alternatives considered include:

- *No Remedial Action.* This alternative involves leaving the chemically impacted sediments in place. In doing so, the initiation and/or continuation of natural recovery processes would be ongoing. Any potential adverse effects due to factors, such as resuspension of chemically impacted sediments, which could occur with other remedies, would be avoided.
- *Limited Action – Periodic Sediment Quality Monitoring.* Similar to the no remedial action option, this alternative would leave the chemically impacted sediments in place, but a monitoring program would be established. The monitoring program

- would consist of sediment sampling and laboratory analysis to determine whether the natural recovery processes are effective in improving site conditions.
- *Limited Action – Institutional Controls.* Similar to the no remedial action option, this alternative would leave the chemically impacted sediments in place, but institutional controls (ICs; e.g., deed restrictions) would be implemented. Deed restrictions would include limiting the future use of IR Site 7 to Port-related activities, to maintain access control and oversight. Limiting future access ensures that no disturbance of the subsurface sediments would occur without prior authorization and evaluation and also restricts disturbance of any chemically impacted sediment that is left in place or used as fill at other locations.
 - *In Situ Capping of AOEC Areas with “Clean” Imported Sediments.* This alternative would leave chemically impacted sediments in place and would cap them with an isolating medium, such as imported “clean” dredged material. A monitoring program would also be implemented to ensure the cap is placed as intended, is effective in isolating the sediments from the environment, and is maintaining its design thickness.
 - *Removal and On-site (Within IR Site 7) Containment of AOEC Sediments – Discharge of Dredged Material along Inboard Face of U.S. Navy Mole.* This alternative would remove the chemically impacted sediments and place them within a diked containment area constructed on top of chemically impacted sediments within IR Site 7. The containment area would be capped with a 2-foot-thick layer of “clean” sediment and a 1-foot cover of asphalt pavement.
 - *Removal and Off-site (Outside IR Site 7) Containment of AOEC Sediments – Discharge of Dredged Material along Outboard Face of U.S. Navy Mole.* This alternative would remove the chemically impacted sediments and place them within a diked containment area constructed on top of chemically impacted sediments outside the IR Site 7 boundary. The containment area would be capped with a 2-foot-thick layer of “clean” sediment and a 1-foot cover of asphalt pavement.
 - *Removal and Discharge of AOEC Sediments at Off-site (Outside IR Site 7) Projects.* This alternative would remove chemically impacted sediments and discharge them outside of the IR Site 7 boundary, such as at a Port development project like the Pier G Slip Fill.

A comparative analysis of the advantages and disadvantages of each remedial action alternative, by AOEC, resulted in a determination of the preferred remedial action alternative (Proposed Plan), as detailed in Bechtel (1997). Each of these remedial alternatives was further evaluated against the Threshold Criteria and the Primary Balancing Criteria as defined in the NCP. Threshold Criteria apply to the overall protection of human health and the environment and compliance with federal and state applicable or relevant and appropriate requirements. Primary Balancing Criteria weigh the positives and negatives of each alternative in terms of long-term effectiveness and permanence, reduction of toxicity, mobility or volume, short-term effectiveness, implementability, and cost.

The Proposed Plan, selected through the FS process, provides the greatest level of protection to IR Site 7 benthic communities, achieves the remedial action objectives, provides the greatest level of long-term effectiveness and permanence, and is easily implementable. The remedies of the Proposed Plan include:

- AOEC-A and AOEC-C: Removal of the AOEC sediments and disposal at off-site (outside IR Site 7) projects, thereby creating a clean substrate supporting the presence of an ecologically productive and diverse benthic community
- AOEC-B: No remedial action necessary to protect the environment as chemical concentrations have not resulted in sediment toxicity or adverse effects on the benthic community
- AOEC-E, AOEC-F, and AOEC-G (Pier AOECs): Limited action necessary for ICs to be implemented for the purpose of preventing unauthorized or uncontrolled disturbance and/or exposure of beneath-pier chemically impacted sediments

Since AOEC-B was accepted as a no remedial action necessary area and does not require a formal remedy, AOEC-B is not discussed further in this report. The remainder of this report will focus on remedial action efforts for AOEC-A, AOEC-C, AOEC-E, AOEC-F, and AOEC-G. For purposes of evaluation, AOEC-C will be subdivided into two areas: AOEC-C East (area to the east of Pier 12) and AOEC-C West (area to the west of Pier 12). This division is based on sediment contamination potential. Figure 1-2 depicts the layout of the project site and the location of each AOEC.

1.3 General Description of Remedial Action

The Remedial Action Objective (RAO) for the chemically impacted sediments of IR Site 7 is to protect the ecologically productive and diverse benthic community within each of the AOEC areas and to be consistent with the existing land use (Port-related and industrial).

1.3.1 AOEC-A and AOEC-C

The selected remedial alternative for AOEC-A and AOEC-C involves eliminating the pathway for potential risk from chemicals of ecological concern (COECs) to the resident benthic community by dredging impacted sediments and disposing of them at an off-site location (i.e., Pier G Slip Fill site) designed to house such material. Sediments are considered to be “impacted” if they contain chemical concentrations for one or more COEC in excess of the Sediment Management Objectives (SMOs) developed for the project and defined in the ROD (Table 1-1).

In order to fulfill the requirements of the LIFOC and SMOs as outlined in the U.S. Navy’s ROD for the property, the Port intends to remove up to approximately 800,000 cubic yards (cy) of chemically impacted sediments from IR Site 7. The dredged material will be placed in the previously authorized Pier G Slip Fill site located near the West Basin for final confined disposal. The practice of disposing impacted sediments inside engineered port fills is extremely common globally, nationally, and regionally. The construction and placement methods have been developed and refined over the past 30 years and significant long-term monitoring data exists to show that port fills are very effective in isolating contaminated sediments. Disposal activities inside port fills are managed under the Clean Water Act and, as with the construction process, water quality monitoring techniques are equally advanced. Documentation to demonstrate the environmental protectiveness of this planned management technique is provided in Section 5.4 of this report.

Specifically, in order to fulfill the proposed project’s purpose, the Port must undertake the following actions related to the chemically impacted sediments in the West Basin:

- Remove four sunken barges from AOEC-C East and West
- Remove the abandoned sonar calibration pier from the U.S. Navy Mole on the southern portion of IR Site 7 in AOEC-C West



- Dredge a sufficient volume of material from AOEC-A and AOEC-C to achieve the target cleanup goals (to be verified by confirmation sampling)
- Transport the dredged material to the separately permitted Pier G Slip Fill site for final confined disposal

Dredging remedies would achieve the RAO upon confirmation that the targeted sediments have been removed as planned and would preclude the need for further remedial action.

1.3.2 AOEC-E

The selected remedy for limited action AOEC-E involves implementing ICs to prevent unauthorized or uncontrolled disturbance and/or exposure to the chemically impacted sediments while still maintaining use of the area. The Port will be responsible for implementing the following:

- ICs in the form of administrative mechanisms
- CERCLA statutory 5-year reviews of the ICs remedy in perpetuity or until ICs have been released or terminated when ecological risk no longer exists

1.3.3 AOEC-F and AOEC-G

The selected remedy for AOEC-F and AOEC-G calls for implementing ICs to prevent unauthorized or uncontrolled disturbance and/or exposure of these sediments while still maintaining use of the areas. The Port will be responsible for implementing the following:

- ICs in the form of legal mechanisms
- Land-use control covenants to restrict use of property to Port-related and industrial uses to be executed between the Port, CalEPA DTSC, and Los Angeles Regional Water Quality Control Board (LARWQCB), and enforced as applicable on future real property owners
- CERCLA statutory 5-year reviews of the ICs remedy in perpetuity or until ICs have been released or terminated when ecological risk no longer exists

1.4 Applicable or Relevant and Appropriate Requirements

Applicable or Relevant and Appropriate Requirements (ARARs) are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law.

For AOEC-A and AOEC-C, the FS concluded that (at a minimum) the following ARARs should be implemented:

1. *Chemical-Specific.* Chemical-specific ARARs are health or risk-based numerical values or methodologies that, when applied to site-specific conditions, establish the acceptable ecological risk screening values for cleanup. During the FS, chemical concentrations for which there would be no cause of concern for ecological risk were determined using a sediment triad approach. The resulting specific concentration thresholds for COECs are listed in Table 1-1. These values were used to define the site SMOs and therefore were the basis for determining the required areas and depths of sediment removal at AOEC-A and AOEC-C.
2. *Location-Specific.* In addition to requirements related to the protection of identified bird and mammal species, associated prey and habitat, and water quality, the location-specific ARARs applicable to this alternative include technical requirements of the Rivers and Harbors Act for construction of dikes and areas near navigation lanes. The site-specific ecological risk assessment results indicate that the protected species identified for the IR Site 7 AOECs are not considered to be among potential receptors. The potential risk posed by the impacted AOEC sediments for marine mammals is estimated as low and could not be directly related to site conditions. Remedial action will further minimize the potential risk posed by sediment COECs and will be conducted in a manner protective of wildlife species. After removal of the chemically impacted sediments, the remaining AOEC-A and AOEC-C sediments would not be expected to pose a potential risk to the marine environment.
3. *Action-Specific.* Sediment removal with the use of dredging equipment is a common occurrence in harbor areas, and a remedial action is not likely to interrupt regular Port traffic or habitats for migratory birds. Relocation of AOEC-A and AOEC-C sediments is not expected to introduce materials that would adversely impact water quality and be inconsistent with beneficial uses of Los Angeles and Long Beach Harbors. The impact of dredging on water quality is expected to be limited to

resuspension of AOEC-A and AOEC-C sediments in the water column in the immediate work area. This will be monitored and mitigated, if necessary, using the following approach:

- The water column will be monitored in accordance with the substantive provisions of Section 6 of the LARWQCB Basin Plan as related to discharge of dredged sediments.
- The monitoring results will be compared to the LARWQCB Basin Plan's Water Quality Objectives and to federal water quality standards.
- Silt curtains surrounding the dredge areas will minimize the extent of the water affected by increased turbidity and sediment resuspension (Bechtel 2003).

For a complete description of ARARs that pertain to this project, including applicable federal and state codes and acts, please refer to Appendix A of the *Final Feasibility Study Report* (Bechtel 2003) or Section 13 of the ROD (USEPA 2007).

2 EXISTING CONDITIONS

2.1 Physical and Chemical Conditions

Physical properties of surface and subsurface sediments throughout IR Site 7 were evaluated through laboratory grain size analyses, total organic carbon (TOC), and observations made during sampling activities. IR Site 7 sediments were observed to be primarily fine-grained (i.e., sediment particles smaller than 62.5 micrometers), averaging 65 percent fines overall. Surface sediment samples collected near the IR Sites 7 entrance contained a high percentage of coarser, sand-sized particles. Sediments located beneath piers, along the northern seawall, and along the U.S. Navy Mole contained a greater percentage of fine-grained particles, more so than the central areas of IR Site 7. TOC was found in a distribution similar to that of the sediment fines, with greater concentrations along the northern seawall, the U.S. Navy Mole, and beneath the piers (Bechtel 2003).

Chemical properties of surface and subsurface sediments were evaluated through laboratory analyses. Previous studies conducted within IR Site 7, by MEC Analytical Inc., in 1999 and Bechtel International, Inc., in 2003, characterized surface sediments along the docks and piers as being contaminated with PAHs, the pesticide dichloro diphenyl trichloroethane (DDT), PCBs, and heavy metals. However, central areas of the West Basin were less contaminated than the nearshore areas. The principal contaminants of concern in the central areas are PAHs.

Sampling conducted during the FS in 1998 (Bechtel 2003) demonstrated that specifically in AOEC-A, mercury was significantly elevated above SMOs to a depth of approximately 5 feet; however, no significant biological effects were detected in toxicity tests. In AOEC-C East and West, mercury, lead, PAHs, and total PCBs were elevated in surface sediments to approximately 3 feet. Additional, toxicity to echinoderms, as well as benthic community effects, were observed in sediments for AOEC-C East and West.

Additional sediment sampling was conducted in AOEC-A, AOEC-C East, and AOEC-C West by Weston Solutions, Inc. (Weston), in June 2007 in order to confirm the results of the FS and further delineate the vertical and horizontal sediment contamination within the dredging parameters of IR Site 7 (Tables 2-1 through 2-13). Sampling locations are shown in Figure 2-1. In AOEC-A, results of 1-foot interval sampling per core location indicated

copper, lead, mercury, and zinc were detected at concentrations greater than the SMOs only in the top 3 feet of sediment with the exception of two sampling locations where mercury and zinc exceeded SMOs as deep as 4 feet. As an area-wide composite, arsenic, copper, mercury, nickel, and zinc were detected at concentrations below SMOs in AOEC-A. In AOEC C-East, no metals were detected at concentrations in exceedance of their respective SMOs, for both 1-foot interval sampling and area wide composite sampling. In AOEC-C West, results of 1-foot interval sampling per core location indicated mercury and zinc were detected at concentrations greater than the SMOs only in the top 4 feet of sediment. In an area-wide composite for AOEC-C West, copper, nickel, and zinc were detected at concentrations below SMOs.

During the environmental review process for the IR Site 7 project, DTSC raised a concern regarding potentially elevated Soluble Threshold Limit Concentrations (STLC) estimated for the West Basin dredged material based on total concentrations. To address these concerns, and to prove that none of the material proposed for dredging would be considered “hazardous material” under California Code of Regulation (CCR) Title 22 regulations, the Port selected six samples from its last round of dredged material characterization (Weston 2007) that contained the highest total metals (i.e., copper, lead, and mercury) concentrations and sent them to an analytical laboratory for rush turnaround time STLC testing. The total metals results for these six samples were comparable with the highest values observed during the entire FS and remedial design process.¹ The results of those tests, presented in Table 2-14, confirmed the Port’s prediction that little, if any, additional leaching would occur from the marine sediments.

Measured STLCs were all well below the CCR Title 22 STLC thresholds, and more than 70 percent of the analyses contained non-detectable concentrations in the leachate. As a result, this data confirms that the material is not a “hazardous waste” according to the CCR Title 22 regulations and would not pose a risk to groundwater resources, even if an underlying groundwater source did exist at Pier G Slip Fill site. These results are not surprising because the affected sediments have been submerged in the marine environment for about 50 years, and thus, any readily leachable metals or organic compounds would have already

1. A total of approximately 500 samples have been tested to date from over 110 distinct sample stations located within the proposed dredge prism. The samples selected for STLC testing represent the upper end of the range of concentrations observed during any of the previous site investigations.

partitioned into the water column and been carried away from the site by the prevailing currents. This theory is supported by the basic concepts of equilibrium partitioning in sediments, which states that in order for contaminants to cross the interface between dredged material solids and water, there must be a difference in chemical potentials. When chemical potentials are equal, the net transfer of contaminants across the solid-water interface is zero, and the mass of contaminant in each phase is constant but not necessarily equal. This stage is considered to be the equilibrium condition, and the ratio of contaminant mass in the solid phase to contaminant mass in the aqueous phase does not change. Over time, as the gradient between the sediment and water phases are minimized, the rate of partitioning is reduced.

2.2 Surrounding Land Use

General land use at and in the vicinity of the former LBNC, IR Site 7, and the future Pier G Slip Fill site is primarily Port-related and industrial. Facilities immediately surrounding IR Site 7 include tank farms; automobile-, cement-, and cargo-handling terminals; and storage terminals. The areas east and west of IR Site 7 are used for commercial shipping, liquid bulk handling, heavy industrial activities and commercial fishing activities. The area north of the former LBNC is used for oil production activities. Terminal Island, where the former LBNC once operated, comprises the western portion of the Port and the eastern portion of the Port of Los Angeles. These ports participate in heavy shipping traffic, container storage, cargo handling, dredging activities, and loading/offloading operations. The future use of IR Site 7 is identified as Port-related and industrial (Bechtel 1997).

The area slated for disposal of IR Site 7 contaminated sediments, the Pier G Slip Fill site, is a 2,500-foot-long by 500-foot-wide slip that extends north from the Southeast Basin and essentially bisects Pier G. This area is used for container cargo offloading and storage. Dredged material will be placed in a manner that will not change the existing land use. The dredged material will be placed behind a 200-foot-thick berm, topped with 40 feet of clean, sandy material, and paved with asphalt.

2.3 Hydraulic Conditions

Southern California coastal tides are semidiurnal, with two low and two high tides of unequal height every 25 hours. Rising tides, which vary with the phase of the moon, enter

Long Beach Harbor and flow up the various channels and basins while falling tides flow in reverse. Tidal currents generally create water circulation patterns, which occur in a clockwise manner within IR Site 7. Mean tide in Long Beach Harbor has a maximum range of 5.5 feet. The maximum velocity at the entrance to Los Angeles and Long Beach Harbors has been estimated at 0.54 feet per second for ebb tide and 0.46 feet per second for flood tide. Velocity magnitudes throughout Los Angeles and Long Beach Harbors generally are small, usually less than 1 foot per second. The temperature within the IR Site 7 water column varies by season; it is cooler in the winter and warmer in the spring and summer. The water depth of IR Site 7 is generally uniform with an average water depth of approximately 40 feet mean lower low water (MLLW). As a result of dredging by the Port, there is a deeper (55 feet MLLW) area along the northern portions of IR Site 7 and a shallower (40 feet MLLW) area in the western portion of the site (Bechtel 1997).

2.4 Geotechnical and Structural Conditions

Appendix A1 of the *Final Feasibility Study Report* (Bechtel 2003) presents a compilation of physical and chemical data for site sediments, as well as soils underlying the surrounding land mass. Based on this information, sediments in the IR Site 7 dredging area consist primarily of interbedded silty sands and sandy silts. The sediment grain sizes ranged considerably, from 90 percent fines to coarse-grained sediment (78 percent sand). The coarsest sediment size was found near the entrance to the West Basin.

The current mudline is approximately 10 to 20 feet deeper than estimated historic mudline surfaces in 1909 and 1937 (Bechtel 2003). There are no known or documented submerged geological features at the current mudline grade, such as rock outcrops. Some instances of submerged debris (including sunken scows) are known to exist at the site and will be removed in their entirety to complete dredging.

The shoreline of IR Site 7 is lined with riprap-armored slopes and pile-supported piers (Bechtel 1997), and the areas planned for dredging are adjoined by existing structures, including the U.S. Navy Mole, Pier E, and the pile-supported Piers 10, 11, and 12.

2.5 Potential for Site Recontamination

After dredging is accomplished, the potential for sediment recontamination is typically dictated by the degree to which source control measures are implemented at the site, as well as the proximity of external sediment sources (such as river mouths or outfalls carrying runoff from adjacent parcels). Since the U.S. Navy has vacated the site, previous operational practices have been discontinued and, therefore, will not be a cause of future recontamination. The Port's marine terminal operations are not expected to contribute to sediment recontamination. Meanwhile, the nearest off-site source of contaminated sediment is the Dominguez Channel, which drains a portion of the greater south Los Angeles area. Portions of the Dominguez Channel flow through the Back Channel and Cerritos Channel before entering the Long Beach Middle Harbor (just east of the proposed dredging areas), which could represent a potential source of future waterborne containments. The U.S. Environmental Protection Agency (USEPA) and LARWQCB are actively working to remediate and restore the Dominguez Channel; therefore, the potential for it to become a future source of containments to IR Site 7 is likely very small. No other known inputs to the area are documented. Any sources of chemical contamination caused by on-site sediments will be removed in the process of conducting this dredging project.

3 DREDGE AND DISPOSAL PLAN

The Port intends to dredge up to approximately 800,000 cy of chemically impacted sediments from AOEC-A, AOEC-C East, and AOEC-C West, as shown on Figure 1-2. Further detail on the dredging plan is provided in the Construction Plans for the project, which were developed by KPFF Consulting Engineers (KPFF) and are included as Appendix A of this report. A typical plan view for AOEC-C West and a cross section of the dredging plan for AOEC-A, prepared by KPFF, are shown on Figure 3-1 and Figure 3-2. Because the engineering design documents were not finalized as contract documents at the time of this document's production, and because a contractor has not yet been retained to complete the work, all design information and specific equipment references presented in this document should be considered "reasonable and conservative estimates" for purposes of evaluating ROD compliance suitability and potential adverse impacts.

Table 3-1 contains the approximate volume and depth of sediment removal, including overdepth allowance for each AOEC as determined by recent sediment sampling by Weston in June 2007 (Section 2.1). These volumes should be considered worst-case estimates and may be subject to revision as the dredging design is finalized.

Material will be dredged and transported to the Pier G Slip Fill site where it will be placed behind a constructed berm and covered with up to 24 feet of clean fill from other sources and paved with asphalt. The Pier G Slip Fill site, designed by Moffatt and Nichol, has been engineered to safely contain chemically impacted materials using a containment berm that is a monolithic dike design along with a sand filter layer behind the rock. Figure 3-3 shows a cross section of the planned fill layers within Pier G Slip Fill site, which indicates how the material will be isolated with the fill. A complete set of construction plans for the Pier G Slip Fill are included as Appendix B of this report. All West Basin dredged material will be placed within the most secure portion—the very bottom and back of the fill. A sand layer that ranges from 70 to over 100 feet thick will separate the West Basin sediments from the inside edge of the rock dike. The thickness of the rock dike will range from about 60 feet thick at the top of the fill to nearly 200 feet thick along the bottom edge. For the model results presented in this document, the most conservative assumptions were applied to the input parameters by assuming a 70-foot-thick sand layer.

In order to ensure that removal of the sediments achieves SMOs, as described in Section 1 of this report, the Port will implement a post-dredging confirmation sampling program during construction. For more information on this program, please see the discussion in Section 6.

3.1 Anticipated Equipment and Assumptions

Besides having to use an electric dredge, there will be no other restrictions on the type of equipment the contractor may use to perform dredging and disposal work as long as all cleanup objectives can be achieved and the selected equipment keeps turbidity generation within acceptable limits according to the expected LARWQCB monitoring requirements.

For the purposes of modeling possible water quality impacts from sediment dredging and disposal, it has been assumed that dredging will be performed using one or more scow-mounted derricks equipped with an appropriately sized clamshell bucket or buckets. The clamshell bucket approach is common for this type of work and is a good indicator of possible water quality impacts during the dredging process. After removal, dredged material will be transported to the Pier G Slip Fill site for disposal. This may be accomplished using a bottom-dump barge, as has been assumed for modeling purposes presented in this report; although, other types of barges or scows could be used by the contractor for this purpose. The dredged material will be placed behind the constructed submerged berm within the slip fill area, likely by direct offloading or dumping from a barge positioned within the slip fill, until the height of sediment fill within the slip gets high enough to preclude entry of a barge into the slip. After this point, the sediment will have to be rehandled over the berm into the slip fill. Rehandling of the material over the berm may be done by the use of a clamshell bucket or digging crane, a hydraulic offloader, or a material conveyor. Regardless of the selected approach, caution will be exercised to ensure that water quality conditions are not compromised.

3.1.1 Production

Dredging production rates (i.e., the volume of dredged material removed per hour) will vary based on the contractor's selection of equipment, site characteristics, and transient effects such as nearby vessel traffic and weather conditions. Production rates may be higher in some areas of the site and lower in others, depending on sediment type, water depths, and presence of debris.

The Port has estimated that dredging could be completed in 62 work days, based on approximately 800,000 cy of dredged material. If only one dredging barge and a 12-cy clamshell bucket were used, then this production schedule could theoretically be obtainable if dredging were conducted 24 hours a day, as per the following calculation:

- The clamshell bucket load can be assumed to contain 70 to 80 percent sediment and 20 to 30 percent water by volume. This means that each load in a 12-cy bucket will contain approximately 10 cy of sediment.
- The percentage of dredge “uptime” can be assumed to be approximately 70 percent. Uptime is the proportion of time that the dredge is actually working, excluding routine maintenance, unexpected maintenance, dredge positioning, encountering unexpected debris, and time needed to periodically switch out the scows used to transport dredged material. This would imply that out of a 24-hour dredging day, approximately 17 hours would be spent conducting actual dredging.
- The cycle time (i.e., the time used to close the bucket with dredged material, pull it out of the water, place the dredged material into a split-hull dump scow, and return the bucket to the water for the next dredge cut) is 45 to 60 seconds per cycle. This means that for 1 working day, or 17 hours (61,000 seconds) of dredging time, approximately 1,000 to 1,300 cycles would occur.
- Each clamshell bucket will contain 10 cy of in situ sediment. With 1,000 to 1,300 cycles, this equals approximately 13,000 cy of dredging per day. Maintaining this rate as an average production rate would enable 800,000 cy of dredging to be completed in approximately 62 days.

Dredging work at the Port usually operates on a two-shifts-per-day basis. If this schedule were used, the overall duration of the work would increase proportionately. Furthermore, it is possible that the theoretical production rate described above will be slowed due to factors relating to the project’s required environmental controls (such as turbidity control requirements, and environmental and water quality monitoring), confirmational sampling, and the resulting potential need to re-dredge some areas. Other factors that could slow actual production rates include debris, weather, and other external influences.



The total project schedule for dredging will depend on the additional time required for mobilization and demobilization (including installation and removal of the turbidity barrier system, if required) and the number of dredges used, among other factors.

3.1.2 Dredging Limits

The dredging limits for IR Site 7 are defined by the target dredging surface elevations and horizontal limits of removal. All dredging limits are shown on plan views and cross-sectional views in the Construction Plans developed by KPFF (Appendix A). Vertical dredging extents were defined by the U.S. Navy and verified by the pre-design sampling undertaken by Weston in 2007. Sample results were compared to the specified SMOs in order to determine a required dredging depth needed to reach expected clean sediments. In AOEC-A and AOEC-C West, Weston (2007) concluded that the depth to clean sediment would be reached by removing the top 4 feet of sediment. In AOEC-C East, Weston (2007) concluded that the depth to clean sediment would be reached by removing the top 2 feet of sediment. These estimates confirmed the information in the U.S. Navy's Proposed Plan. An additional 2 feet of dredging depth will be allowed below the design dredging elevations as a tolerance for dredging accuracy. Dredged side slopes have been designed to tie into existing side slopes, with variable offset distances selected to avoid undermining or reducing the stability of adjacent wharf structures and piers.

3.1.3 Placement of Sediment Within the Pier G Slip Fill Site

Chemically impacted dredged material from AOEC-A, AOEC-C East, and AOEC-C West will be disposed of within the Pier G Slip Fill site. A cross section of the Pier G Slip Fill site is shown on Figure 3-3 and detailed construction plans are included in Appendix B. It is expected that barges or scows will be filled during the dredging process and used to transport the dredged material to the Pier G Slip Fill site, using a tugboat for power and maneuvering. Once behind the submerged berm inside the slip fill, as confirmed by real-time kinematics positioning and/or global positioning system (GPS), the dredged material will be deposited within the slip.

When the Pier G Slip Fill reaches an elevation of approximately -15 feet MLLW, it will be infeasible for a bottom-dump barge to enter into the slip fill area because of its draft

requirements. From this point forward, rehandling of the dredged material will be necessary due to the limited dumping capabilities of the barge and raised dike. It is assumed that the dredged material will be rehandled from the bottom-dump barge, or a similarly sized haul barge, over the dike and into the slip fill by the use of a clamshell bucket, a hydraulic offloader, a material conveyor, or similar methodology. The selection of rehandling equipment for this later stage of filling will be left to the contractor, subject to the engineer's approval. Regardless of the method selected, water quality conditions may not be compromised during the offloading process.

Material dredged from area AOEC-A will be placed in the Pier G Slip Fill first, before materials from AOEC-C East and AOEC-C West are placed. This placement is due to the chemical concentrations in AOEC-A being higher than chemical concentrations in AOEC-C East and AOEC-West; thus, first placing the dredged material from AOEC-A will ensure that its sediments are buried deepest and thus most isolated within the slip fill.



4 CONSTRUCTION SCHEDULE AND SEQUENCING

This section describes the planned construction sequencing for dredging AOEC-A, AOEC-C East, and AOEC-C West within IR Site 7. Dredging activities are anticipated to commence in the early 2010 in AOEC-A (dredged first due to the presence of higher level of contaminated sediments) and dredging in AOEC-C East and West will follow. The following sequence of activities is listed in order of operation:

- Remove and dismantle four sunken barges from AOEC-C East and West
- Remove the abandoned sonar calibration pier from the U.S. Navy Mole on the southern portion of IR Site 7 in AOEC-C West
- Construct containment berm at Pier G Slip Fill site
- Mobilize construction equipment
- Dredge contaminated sediments from AOEC-A and place dredged material within the Pier G Slip Fill site
- Dredge contaminated sediments from AOEC-C West and place dredged material within the Pier G Slip Fill site
- Dredge contaminated sediments from AOEC-C East and place dredged material within the Pier G Slip Fill site
- Raise containment berm, as necessary, as height of placed sediment within the Pier G Slip Fill increases
- Place clean fill and soil surcharge and perform final grading operations
- Demobilize construction equipment

After dredging in each AOEC has been deemed complete by the contractor, the Port will review a post-dredging bathymetric survey to verify that the required dredging depths and extents have been achieved and will collect and analyze sediment samples to confirm all contaminated sediments above the SMOs have been removed. During this post-dredging testing phase, the contractor may elect to mobilize their equipment and begin dredging in another AOEC; however, the contractor may be required, at the Port's discretion, to remobilize its equipment back to the previous AOEC and remove any contaminated sediments above the SMOs that may still remain.

At the completion of dredging in the AOECs, placement of clean material and soil surcharge and final grading operations will be completed at Pier G Slip Fill containment berm.

Eventually, once the material in the fill has settled, some of the excess surcharge material will be removed, and the site will be paved and used for terminal operations, including the addition of stormwater collection systems to prevent runoff and infiltration into the fill.

5 POTENTIAL CONSTRUCTION IMPACTS AND BEST MANAGEMENT PRACTICES

Dredging and in-water sediment disposal typically create turbidity in the water column, an effect that is short-term in duration but will need to be minimized by the contractor through the use of operational BMPs and controls. Water quality conditions will be monitored throughout construction, and the contractor will be required to meet all applicable water quality standards that will be specified as part of a 401 Water Quality Certification for the project or substantive equivalent.

Resuspension of sediment during mechanical dredging operations can result from the following bucket-related actions:

- Effect of bow wave, lowering the clamshell bucket
- Impact of the bucket with the bed
- Closure and removal of bucket from the bed
- Spillage and sediment sloughing during retrieval up through the water column
- Spillage and gravitational leakage from the bucket during hoisting and swinging from water to the split-hull dump scow

In addition to sediment loss from the bucket during mechanical dredging, sediment loss from the split-hull dump scow may also occur if the scow load reaches and exceeds its capacity. To minimize this potential, overflow and spillage of sediments from split-hull dump scows will be limited by the project specifications.

5.1 Effects of Resuspended Sediments Due to Dredging Impacts

In 2003, members of the Los Angeles Contaminated Sediments Task Force (CSTF) conducted a detailed review of the potential adverse impacts to biological organisms as a result of dredging induced turbidity. The complete results of the study are presented in *Literature Review of Effects of Resuspended Sediments Due to Dredging Operations* (Anchor 2003), and a summary of the results are presented below.

The results of the CSTF literature study (Anchor 2003) indicated that by comparing the dredging-induced suspended sediment concentrations observed in the field along with the associated physical effects of such concentrations as reported in relevant project literature,

very few dredging projects have ever been shown to produce suspended solids concentrations in the range documented to cause significant adverse effects to sensitive aquatic biological organisms (Anchor 2003). The threshold at which total suspended solids (TSS) are predicted to produce acute lethal effects is 760 milligrams per liter (mg/L). Sublethal effects are not expected to occur at concentrations below 100 mg/L. To put these numbers into perspective, a review of previous monitoring data for mechanical dredging projects within the Los Angeles region (Anchor 2003) shows that about 90 percent of all the monitoring data collected from water column sampling downcurrent of recent dredging operations revealed TSS concentration below 100 mg/L. It is important to note that nearly all of these examples were projects conducted without the use of silt curtains to minimize off-site transport. Thus, even in the 10 percent of the projects where TSS concentrations exceeded sublethal thresholds, the use of silt curtains could prevent exposure beyond the immediate dredge area.

Potential impacts from dredging of contaminated sediments are more difficult to assess (Anchor 2003). Most of the information concerning the effects of contaminated sediments on marine organisms deals with the impacts of settled sediments. Few studies have dealt with resuspended contaminated sediments. Organisms exposed to resuspended contaminated sediments can develop physiological problems due to direct exposure to dissolved contaminants or bioaccumulation of metals and organic chemicals. However, much of the data suggests that significant adverse impacts do not occur at resuspension levels and durations typically associated with dredging projects. In general, previous studies indicate that potential effects from dredging are transient and not significant. Again, the conservative use of silt curtains for all contaminated sediment dredging will be used with the current project and will further minimize the potential for adverse impacts.

5.2 Potential Short-term Water Quality Impacts

The potential for water quality impacts from contaminated sediment dredging and disposal has been estimated using measured sediment characteristics, as well as documented placement techniques. Laboratory elutriate testing was used to evaluate the potential for suspended sediments to contribute dissolved contaminants to the surrounding water column. In addition, the computer model DREDGE (developed by the U.S. Army Corps of Engineers [USACE]) was used to predict short-term water quality impacts at the point of

dredging, and the computer model Short-term Fate of Dredged Material Disposal in Open Water Models (STFATE; also developed by USACE) was used to predict water quality impacts at the Pier G Slip Fill site during sediment disposal, which was accomplished using split-hull dump scows. The methods and results of each of these predictive modeling efforts are described below.

5.2.1 Water Quality Impacts at Point of Dredging

To evaluate the potential for short-term water quality impacts during dredging, analytical tests on site sediments, as well as computer-based model predictions, were considered. Analytical measurements included the results of elutriate tests for comparison to water quality criteria, as well as computer models to simulate resuspension. These results were then compared to published data on possible TSS-related effects.

Results of the Standard Elutriate Test (SET) were evaluated to assess potential impacts from dissolved constituent release into the water column. Site-specific SET results were readily available for this site (Weston 2007) and were usable for drawing conceptual-level conclusions regarding potential environmental impacts from the dredging process. The SET was conducted using composite samples from each of the IR Site 7 AOECs. Table 5-1 presents the results of elutriate testing, which indicated dissolved concentrations below California Ocean Plan water quality criteria.

These results suggest that it would be highly unlikely for short-term chemical releases from sediment at the point of dredging to exceed water quality criteria. Furthermore, the use of BMPs (e.g., silt curtains) will mitigate any potential chemical releases or water quality impacts.

5.2.2 DREDGE Model Input

The computer model DREDGE, developed by the USACE as part of its Automated Dredging and Disposal Alternatives Modeling System (ADDAMS) suite of modeling software, was used to predict the suspended sediment plume resulting from resuspension of dredged sediments during dredging, if conducted mechanically using a clamshell bucket. Although the choice of dredging equipment, means, and methods will

be left to the contractor, the mechanical clamshell bucket approach is a common one and is useful as an overall indicator of possible water quality impacts during the dredging process.

As was stated previously, the mechanisms by which dredging could cause resuspension of sediment particles include bucket impact, closure, withdrawal, and lifting of sediment to a scow. DREDGE uses an expected resuspension rate in conjunction with field parameters (e.g., water current, sediment settling velocities, etc.) to predict the total suspended sediment concentration released into the water column at the point of dredging and at points cross stream and downstream. These predicted resuspension concentrations were then compared to the CSTF literature study results (Anchor 2003; Figure 5-1) in order to assess the potential for adverse risks.

DREDGE models the transport of suspended sediment from dredging operations into two distinct areas, “near-field” and “far-field.” The area in the immediate vicinity of the dredging operation (typically 30 to 60 feet downcurrent from the dredge site) is the zone of the highest TSS. This area is termed the “near-field” and is dominated by mixing and currents induced by the dredging process. In the “far-field,” suspended sediment transport is controlled by advection, turbulent diffusion, and sedimentation. The DREDGE program utilizes a two-dimensional, vertically averaged transport model published by the USACE to analyze sediment transport in the “far-field” (Hayes and Je 2000).

Table 5-2 presents key input parameters used in the DREDGE model for the prediction of TSS concentrations at selected distances from the point of dredge with an open clamshell bucket. Modeling was completed for a variety of conditions and distances from the dredging operation. A key point of interest for this analysis was a distance of 300 feet from the point of dredging—a distance which has been defined as a water quality monitoring point of compliance (per Waste Discharge Requirements [WDRs] put forth by the LARWQCB) for similar projects in the recent past.

This modeling was also used to evaluate various typical physical conditions and equipment use for the project. The model was run for both 8-cy (6.1 cubic meters) and

12-cy (9.2 cubic meters) bucket sizes and for various representative depths within the AOECs. While the actual bucket size and type will be left to the contractor, these bucket sizes and their associated cycle times (60 seconds in both cases) were selected for modeling purposes based on project-specific conditions and needs and on typical equipment and operating procedures used for similar projects performed in the Southern California region. These bucket sizes and types also represent reasonable worst-case scenarios for predicting associated impacts. Additionally, the cycle times selected are considered conservative in terms of resuspension, as longer cycles in excess of 2 minutes are not uncommon during remedial dredging. In general, longer cycle times tend to decrease the resuspension of sediments, if other parameters relating to operations are held constant.

Diffusion coefficients and sediment characteristics were selected based on previous DREDGE analysis performed for the Los Angeles River Estuary Pilot Study (CSTF 2002). Existing water depth at the site ranges from approximately 35 to 50 feet, while post-dredge depths will range from approximately 44 to 55 feet for AOEC-A, 48 feet for AOEC-C East, and 45 to 49 feet for AOEC-C West. The existing water depths and post-dredge water depths for each AOEC were used in the model to represent worst-case and final scenarios that can be expected during construction. In most cases, TSS concentrations generally increase with decreasing water depth.

5.2.3 DREDGE Model Results

Using the assumptions discussed above, the DREDGE model predicts the TSS concentrations associated with the dredging as a function of distance from the dredge. Results are presented graphically in Figures 5-2 through 5-7.

In AOEC-A and AOEC-C West, TSS concentrations were predicted to be approximately 20 to 34 mg/L at a distance of 30 feet from the point of dredging, assuming a 12-cy clamshell bucket is used. At this distance, the predicted TSS concentration is lessened slightly to approximately 13 to 22 mg/L, if an 8-cy bucket is assumed. In AOEC-C East, TSS concentrations 30 feet from the point of dredging are predicted to be slightly higher than they were in AOEC-A and AOEC-C West, about 36 mg/L assuming a 12-cy bucket is used and 24 mg/L if an 8-cy bucket is used.

TSS concentrations were also predicted at a greater distance from the point of dredging—in particular, the 300-foot distance that has typically been defined as a water quality monitoring point of compliance for similar projects in the past. In AOEC-A, at 300 feet from the point of dredging (Figures 5-2 and 5-3), TSS concentrations are predicted to drop significantly to 4 to 7 mg/L depending on the size of the clamshell bucket used. In AOEC-C East, at 300 feet from the point of dredging (Figures 5-4 and 5-5), TSS concentrations are predicted to be no higher than 5 mg/L. In AOEC-C West, at 300 feet from the point of dredging (Figures 5-6 and 5-7), TSS concentrations are expected to be about 4 to 8 mg/L depending on the size of the clamshell bucket used.

As distances increase away from the point of dredging, TSS concentrations in AOEC-A and AOEC-C West tend to decrease gradually. TSS concentrations in AOEC-C East decrease at a much greater rate due to the fact that the average grain size in this area is larger; thus, the material settles out faster.

When compared against known thresholds for acute lethal and sublethal TSS impacts (Anchor 2003), the relatively low predicted TSS concentrations during dredging operations are expected to have negligible impacts to the aquatic environment.

It is important to note that the predicted TSS concentrations resulting from dredging activities would be in addition to any ambient suspended solids that may already be present in the water column. The CSTF literature study (Anchor 2003) notes that 50 percent of the background monitoring data collected in the region showed ambient TSS concentrations of 31 mg/L, which is significantly higher than the predicted TSS concentrations for the current project. Even combining the predicted TSS concentrations resulting from dredging activities to the ambient levels, the resulting values are still well below the threshold used to determine the potential for adverse effects.

5.2.4 Prediction of Water Quality Impacts at Point of Disposal

The contractor will be required to devise its own process for transporting sediment and placing it within the Pier G Slip Fill site. The majority of the sediments dredged for this project can be hauled directly into the slip fill area where they can be deposited. Various types of haul barges could be used for this purpose, including bottom-dump barges or

flat barges with perimeter walls for sediment containment. Later in the sediment disposal process, the containment berm will reach a height that will preclude entry by barge, at which point the contractor will need to devise an alternative means for depositing sediment within the slip fill. The dredged material can be rehandled from the holding scow over the dike and into the slip fill by the use of a clamshell bucket, a hydraulic offloader, a material conveyor, or similar methodology. The final selection of rehandling equipment will be left to the contractor and subject to the engineer's approval.

For the purposes of this evaluation, the potential for water quality impacts during disposal in the Pier G Slip Fill was assessed using both the results of the SET (for dissolved chemicals) and a computer model (STFATE, Version 5.01; Johnson et al. 1994) to model disposal and sediment resuspension for a representative disposal mechanism (i.e., the use of a bottom-dump barge). The STFATE computer model simulates resuspension and "stripping" of particulates during their descent after dumping and predicts the concentration of TSS remaining in suspension (in units of mg/L) at a particular time. Successive time steps can be used to predict the fate of the remaining suspended material in waters of Pier G Slip Fill site. The results of the STFATE modeling were compared to the results of the CSTF literature study (Anchor 2003) to evaluate the potential impacts to the aquatic environment.

The SET results are reflective of water quality impacts from dissolved chemicals over relatively short time intervals, specifically 1 hour after disposal. As was presented earlier and as depicted in Table 5-1, the elutriate test results indicate that the concentration of dissolved chemicals were all well below applicable water quality criteria; therefore, exceedances of water quality criteria are considered to be highly unlikely in the short term at the point of disposal.

5.2.5 Prediction of Spread of Placed Sediment

STFATE also allows prediction of the distribution of sediment mass on the seafloor after dumping from a barge. The sediment mass is subdivided into three primary components with different properties and settling velocities: clumps (settle to the bottom essentially instantly), sand (settles at a slower rate), and fines (are suspended in the

water column as turbidity). Over time, each component builds up on the bottom surface in response to settling velocity, fall height, and ambient current velocity of surface waters, such that a mound of settled sediment is predicted. This mound of settled sediments can be compared to the geometry of the Pier G Slip Fill site and used as a guide for limiting the split-hull dump scow's positioning during dumping to ensure that sediment is not lost outside of the identified disposal area.

5.2.6 STFATE Model Input

Input parameters for the STFATE model included the following:

- Geometry of the sediment disposal area, including horizontal dimensions and water depth (defined according to a grid of points spanning the area of interest)
- Conditions of the ambient water column (i.e., density, salinity, and current velocity)
- Disposal operation data, including parameters that reflect typical dimensions, draft, and disposal rate from a disposal scow
- Dredged material physical properties (i.e., grain size, clumping fraction, etc.)

Again, the actual disposal means, methods, and equipment will be selected by the contractor. The input parameters used for this modeling effort are intended to represent reasonable and representative equipment types and anticipated site-specific conditions at the time of disposal, as well as the physical characteristics of dredged material as determined from sampling data expected to be representative of the material being disposed of at Pier G Slip Fill site. Key input parameters used in modeling are summarized in Table 5-3. AOEC-C East has not been modeled because the elevation of the slip fill will already be at approximately -15 feet MLLW prior to its placement, at which point the material will need to be rehandled over the berm for placement into the fill site.

5.2.7 STFATE Modeling Results

This section presents a summary of the interpreted results from STFATE. These results should be considered conservative estimates, as STFATE cannot precisely predict actual conditions during construction.

5.2.7.1 Predictions of Deposited Sediment Thickness

Each sediment load that is placed within the slip fill was estimated to be 1,200 cy in volume. For dredged material from AOEC-A and AOEC-C West, STFATE predicted that each 1,200 cy dump event would create a mound of deposited material ranging in thickness from 1.8 to 1.9 feet and extending about 150 to 200 feet from the center of the dumping, as shown on Figures 5-8 and 5-9. This setback distance is essentially equivalent to the amount of setback from the berm face for placed sediments within the slip fill, as shown on the typical berm cross section (Figure 3-3). The mound would be comprised of a combination of clumps, sands, and fines. This prediction can be used as a general guideline, recognizing its inherent imprecision, and can be adjusted in the field depending on observations during construction.

5.2.7.2 Predictions of Total Suspended Solids Concentrations

The TSS concentrations resulting from sediment release during a split-hull dump scow disposal was predicted for each of the two areas and for time periods of up to 20 minutes after dumping. Assuming AOEC-A will be the first area to be dredged and placed in the Pier G Slip Fill (Figure 3-3); it was analyzed assuming a disposal site water depth of 48 feet. TSS concentrations at three water depths, 7 feet (near the surface), 24 feet (mid-depth), and 48 feet (seafloor) below the water surface were analyzed to evaluate TSS plume dispersion with depth.

AOEC-C West was modeled assuming a 37-foot water depth and TSS concentrations were predicted at the surface (1 foot below water depth), at mid-depth (15 feet below water depth), and at seafloor (37 feet below water depth).

The following sections discuss the predicted water column TSS concentrations and lateral extent of sediments spreading from AOEC-A and AOEC-West.

5.2.7.2.1 AOEC-A

In general, the STFATE model suggests that the plume of suspended sediments, which forms after the sediment is released, is wider and more extensive at depth than it is at the surface. The predicted turbidity plume at the deepest depth

extends about 150 feet from the dumping point as viewed at the surface 20 minutes (1,200 seconds) after the initial dump, as shown on Figure 5-10.

At a depth of 7 feet below the water surface, a small and diffuse TSS plume is predicted to extend over an area measuring approximately 150 feet by 150 feet. The TSS concentration at the center of the turbidity plume is expected to be only 0.34 mg/L, which is essentially negligible. It should be noted that the STFATE model predicted minimal TSS concentrations (below .001 mg/L) within the upper 6 feet of the water column during all of the disposal scenarios.

At a depth of 24 feet below the water surface, the TSS plume is predicted to extend over an area measuring roughly 250 feet by 250 feet, where a worst-case scenario predicted TSS concentration of about 35 mg/L at the center of the plume.

At a depth of 48 feet below the water surface, the TSS plume is predicted to extend over an area measuring 300 feet by 300 feet. A maximum TSS concentration of 171 mg/L is predicted to occur in the center of the plume. At distances over 200 feet from the dump location, minimal amounts of suspended sediment are predicted.

5.2.7.2.2 AOEC-C West

In general, the STFATE model predicts a relatively wide plume will develop both at shallow depths (1 foot), mid-depth (15 feet), and at the bottom depth (30 feet below the water surface) for AOEC-C West sediments. Maximum TSS concentrations of 10, 38, and 164 mg/L are predicted at the center of the plume for shallow depths, mid-depths, and greater depths, respectively (Figure 5-11).

5.2.7.2.3 Conclusions

Under conditions modeled for the AOEC-A and AOEC-C West, significant TSS concentrations are not expected after 20 minutes (for a single dump event) at distances of approximately 300 feet from the disposal point (the anticipated point of compliance for water quality monitoring, based on recently issued WDRs for similar projects in the region). Furthermore, when compared against known and

documented thresholds for acute and sublethal impacts from TSS (Anchor 2003), the estimated suspended solids concentrations for IR Site 7 are predicted to have negligible impacts to the aquatic environment.

Sediment disposal occurring at locations less than 300 feet from the Pier G Slip Fill containment berm is possible without significant impacts to water quality, because the model conditions do not account for the presence of the partially constructed berm, which will act as a subsurface barrier and help minimize transport of sediments from the slip fill area. Thus, the 300-foot target setback for disposal is a very conservative distance. Regardless of where the material is placed within the fill, the contractor will need to be attentive to the sequence and spacing of their dump events, particularly at locations closer to the berm, to ensure materials settle within the fill site. If dump events occur in succession or prior to sediments fully settling, higher TSS concentrations than those presented may be encountered. Should higher TSS concentrations occur, the contractor would be required to alter its construction approach to eliminate off-site transport. This altered approach could include moving the disposal location further into the fill, raising the height of the submerged dike, or using a silt curtain to contain the suspended sediment.

The sensitivity of the STFATE model input parameters was tested to determine potential changes in suspended solids as a result of varying the fill target plan for the Pier G fill site. Water depths were altered to simulate portions of the West Basin material being placed in the fill at different layers during construction and the output was negligible. Suspended solids concentrations predicted for a point 300 feet from the disposal barge increased slightly (less than 5 percent) when the overlying water depth was decreased by 10 feet or 25 percent. This change is likely a result of having less area for settling, which requires slightly greater lateral distance. Overall, the data suggests that the exact order of the material entering the Pier G fill site is not critical as long as there is both a vertical and horizontal layer around the contaminated sediments to contain them in the final design.

5.2.8 Rehandling over the Containment Berm

The modeling results presented above are specific to the process of direct dumping from a split-hull dump scow or bottom-dump barge located inside the slip fill area. It is anticipated that when sediments placed in the Pier G Slip Fill reach an elevation of approximately -15 feet MLLW, entry into the slip by barges (particularly for bottom-dump barges, which draw a relatively deeper draft when loaded) will be precluded. At that point, it would be necessary for the dredged material to be rehandled over the berm.

As shown on the Pier G Slip Fill cross section and dimensions presented on Figure 3-3, this point will occur during the placement of dredged materials from AOEC-C West and AOEC-C East. Due to the order of the sediments being placed, it appears likely that the dredged material from AOEC-C East will need to be placed in the slip fill area by rehandling it over the containment berm and into the slip fill rather than by directly dumping it from a barge.

The contractor will be required to devise its own process for moving material into the slip fill for approval by the engineer. As stated previously, rehandling of dredged material may involve the use of a clamshell bucket or digging crane, a hydraulic offloader, a material conveyor, or other means. Each of these equipment types and methods will have a range of possible placement rates and placement locations within the slip (as measured in terms of distance from the berm). The contractor will need to develop its sediment rehandling and offloading equipment, means, and methods in such a way as to ensure their continued compliance with water quality criteria outside of the disposal area (e.g., hay bales, silt fences, etc.). For instance, when the top of the berm reaches an elevation of -5 feet MLLW, the berm will not reach the water surface and suspended solids can still be carried outside of the slip fill area, particularly during an outgoing tide. Later, when the berm has been raised further (to an elevation of +8 feet MLLW after its fourth lift has been added), it will act as a barrier to water within the slip fill; although, even under this scenario, continued filling of the slip with sediment will require an exit point for water from inside the fill area.

5.2.9 Dredge Residual Management

Residual contamination is typically encountered in surface sediments following the completion of an initial remedial dredging pass. The presence of residual contaminants is inevitable to some degree when dredging contaminated sediments, due to the inability of mechanical or hydraulic dredging equipment to completely and perfectly remove all sediment within a submerged dredge prism. Resuspension of sediment during bucket impact and retrieval, or disturbance during hydraulic excavation, results in fine-grained sediment becoming suspended and transported away from the immediate location of the dredge. Larger grain sizes, such as sand, settle out of the water column fairly rapidly while finer-grained sediment, such as silts and clays, can remain in suspension for longer periods of time (traveling farther distances before settling out).

5.2.10 Post-dredge Residual Expectations

A variety of recently completed remedial dredging projects has demonstrated that dredge residuals are commonly spread both within dredged areas and, in some cases, off site. Site conditions, dredging equipment, and BMPs can all affect residual concentrations. A survey of recent projects demonstrates that residuals can be expected in all dredging projects to differing degrees and can result in post-remediation contaminant exposure within and immediately beyond the dredge prism if adequate control measures are not taken (Desrosiers et al. 2005; Stern and Patmont 2006). Residuals can potentially result in a thin layer of recently deposited sediment in which post-remediation surface concentrations may be similar to pre-remediation levels. Using a mass balance-based measure of residuals from a series of well-documented dredging projects, realistic expectations of residuals can be used to plan for and manage dredge residuals. The *Evaluation of Post-dredge Monitoring Results to Assess Net Risk Reduction of Different Sediment Cleanup Options* (Stern and Patmont 2006) summarizes detailed residuals measurements from the following project sites:

- Fox River, Wisconsin (pilot projects)
- Lavaca Bay, Texas (pilot project)
- New Bedford Harbor, Massachusetts (pilot project)
- Reynolds Aluminum, New York
- Hylebos Waterway (mouth and middle), Washington

- Middle Waterway, Washington
- Duwamish/Diagonal, Washington

Evaluating the monitoring data for these remedial dredging projects showed that after dredging to the design depth, the amount of sediment that remained on site as a residual layer ranged from approximately 2 to 9 percent of the mass of sediment, or contaminant, dredged. The median amount of dredge residuals remaining in these environmental dredging projects was approximately 5 percent of the mass of sediment/contaminant dredged. Similar dredge residual amounts have been reported for mechanical and hydraulic dredging operations, both with or without the use of BMPs (e.g., silt curtains).

5.2.11 West Basin Residual Analysis Results

For the purposes of this *Remedial Design and Remedial Action Work Plan*, a range of 2 to 6 percent (for sites with little debris or rock/hardpan surface) of the mass of sediments loosened by the dredge in the AOECs was assumed to settle back within or immediately adjacent to the newly cut surface of the dredge prism. In addition, the concentration of residuals was assumed to be equal to the average concentration of the sediment dredged from the immediate area. Based on these assumptions and using the preliminary dredge plan design and sampling data described previously, the approximate ranges of post-dredge residual thickness in AOEC-A, AOEC-C East, and AOEC-C West were estimated.

These calculations reveal that without dredge residual management, assuming an average 2 to 6 percent mass loss during dredging, the estimated post-dredge residual thickness will likely be approximately 2 to 6 inches in AOEC-A, 1 to 4 inches in AOEC-C East, and 2 to 6 inches in AOEC-C West (as summarized in Table 5-4).

The concentration of chemicals within the residual sediment layer can be reasonably predicted through a statistical, proportionate averaging of the chemical mass indicated by the various samples obtained from the dredged area. Using the sediment chemistry data provided by Weston (2007) during the most recent sediment sampling program for IR Site 7, the 95 percent Upper Confidence Limits (UCLs) were calculated for each

individual AOEC. Although average values would be acceptable in this analysis, the 95 percent UCL values provide a more conservative end value. The resulting 95 percent UCL values were compared with the site-specific SMOs presented in Section 1. These values assume full removal of the specified dredge prism, plus the full amount of allowable overdredging of underlying materials.

As shown in Table 5-5, the 95 percent UCLs for various constituents in each AOEC are below the approved SMOs. Results indicate that even though a residual layer will remain after dredging is complete, the layer is not expected to contain chemical concentrations in excess of SMOs for the project. Furthermore, conformational sampling will be conducted to ensure SMOs have been met.

5.3 Contractor Controls and Best Management Practices

To ensure water quality standards are maintained throughout construction, permits and final construction documents will require the contractor to implement a quality control plan and follow BMPs. The CSTF developed a list of available dredging BMPs that may be used as a starting point for consideration. Refer to Appendix C for a description of the technologies available and a toolbox for selecting appropriate BMPs. The contractor's performance in this regard will be documented by a LARWQCB-required water quality monitoring program, which will be implemented by the Port's representative.

5.3.1 Operational Controls

At a minimum, the following BMPs will be incorporated into the project specifications to be implemented by the contractor during the duration of the construction period:

- Overtopping of the split-hull dump scow will not be allowed, to avoid leakage of sediment directly into surface water.
- The bucket will be fully closed during lift up.
- Excessive overdredging will be discouraged through the payment process. The contractor will only be paid for finite digging.
- All equipment will be required to be in good working order and shall be maintained.
- A spill containment plan will be prepared and all necessary cleanup materials shall be readily available if the need arises.

- Silt curtains will be used during dredging operations within the AOECs.

5.3.2 Specialized Equipment

In order to help control loss of suspended solids beyond the immediate work areas, floating silt curtains will be required during dredging operations. As part of the project specifications, it will be a requirement for the contractor to maintain silt curtains around all dredging work as to reduce the potential for water quality impacts and the escape of suspended solids beyond the project dredging boundaries.

If a water quality exceedance occurs, the contractor may elect to use a cable-arm clamshell bucket (frequently referred to as an environmental bucket) for dredging. This bucket design typically reduces loss of sediment and turbid water during closing and withdrawal of the bucket from the water. A cable-arm bucket, however, may not be sufficiently heavy enough to excavate denser sediments or large debris. The use of this type of bucket will be left to the contractor's choice and discretion.

To ensure water quality criteria requirements are maintained, the specialized equipment, plus the BMPs mentioned in Section 5.3.1, will need to be supplemented by appropriate sequencing and production rates by the contractor.

5.3.3 Water Quality Monitoring

Water quality monitoring will be conducted at a predetermined frequency by the contractor and will be performed in accordance with the regulatory permits obtained for this project. Specifically, water quality monitoring will be required through the 401 Water Quality Certification process with the LARWQCB. When not in compliance with the water quality criteria, the contractor will be required to correct the condition. The contractor may choose to slow down, stop, or modify their operations until the adverse water quality conditions are returned to normal.

The frequency of water quality monitoring will initially be high (e.g., once per day) but may be lessened as dredging proceeds and data are collected to document the results, provided that no water quality exceedances are noted.

Appendix D presents more details on the elements of the expected water quality monitoring requirements for the site. See Section 6 for further discussion of contingency actions that may be undertaken in the event of water quality exceedances.

5.3.4 Post-dredge Monitoring

A post-dredge bathymetric survey will be performed to verify that the contractor has reached the target dredging depths and extents, as predicted to accomplish full removal of chemically impacted sediment to comply with the ROD.

Confirmation sampling will be performed after dredging is completed in each area to verify successful removal of chemically impacted sediments. The sampling program will be designed to evaluate whether the remaining sediments meet SMO requirements or if additional dredging is necessary for compliance with the ROD.

Confirmatory sampling depths need to be adequate to estimate potential exposure to ecological receptors, encompassing the expected biologically active zone of the sediment (USACE 2008). At IR Site 7, the biologically active zone is anticipated to extend to a depth of approximately 20 centimeters (approximately 8 inches) below the surface (Weston 2007). Therefore, confirmatory samples will be taken from the upper 20 centimeters of sediment.

It will also be valuable to obtain samples from below the residual layer that is likely to be present after dredging. Therefore, the samples will be extended an additional 20 centimeters below the initial depth of 20 centimeters, such that the total sampled depth will be 40 centimeters (or approximately 16 inches). The lower sample depth interval will be archived for possible laboratory testing, if any upper residual layer samples indicate possible issues with chemical concentrations.

See Section 6 and Appendix E for further discussion of the development of the Confirmatory Sampling Plan for this site.

5.3.5 Management of Dredging Residuals

BMP controls have been developed as part of the contract specifications to minimize, to the extent practical, the extent and magnitude of residual sediment deposition. These controls will include the use of a precise horizontal and vertical positioning system and real-time monitoring of the dredge head and bed elevation. The contractor will also be required to control vessel draft and movement as to limit the disturbance of bottom conditions and contaminated sediments via propeller wash scour from their vessels.

5.4 Long-term Effectiveness of Disposal Location

In an effort to estimate chemical concentrations in porewater expressed through the Pier G Slip Fill containment berm under steady-state (long-term equilibrium) conditions, chemical partitioning and migration were modeled in response to porewater flow and tidal exchange processes through the berm. The model operates on the basic assumption that porewater and/or tidal flux has a net outward flow direction through the contained sediments, where the contaminants partition from the solid phase into the groundwater, and through the containment berm, which is constructed of rock and clean sand fill. As the dissolved contaminants move through the containment berm, they are predicted to undergo biodegradation while at the same time partitioning onto the granular berm material. The model predicts steady-state concentrations of sediment or porewater expressed at the surface of the inside edge of the berm (i.e., point where the sand layer touches the inside of the rock dike) by applying developed formulas to represent these various processes. The chemical isolation performance of the berm can then be evaluated by comparing the predicted steady-state surficial concentrations to selected toxicity guidelines or criteria. Thus, the model output is extremely conservative in its design, because it does not account for any additional degradation that could occur within the rock portion of the dike, which in some areas will be nearly 200 feet thick or twice the thickness of the sand layer.

The chemical concentrations for sediments underlying the cap were calculated using sampling results from Weston (2007). The chemicals of potential concern (COPCs) were determined after evaluating the data to be metals (i.e., arsenic, chromium, copper, lead, mercury, selenium, silver, and zinc). Organic chemicals that were tested (PAHs, PCBs, and DDT) were not detected in any samples and, therefore, do not appear to be significant in terms of overall sediment containment evaluation.

Using the model developed by Reible et al. (2004), the chemical concentrations expressed through the berm were calculated as a balance between the flux into the berm (from the confined sediments behind it), the flux leaving the berm and thus biologically available (characterized by a mass transfer coefficient, k_{bio}), and the benthic boundary layer in the overlying water column (characterized by a mass transfer coefficient, k_{bl}). Considering that porewater seepage and transport of contaminants may potentially occur independently of these processes, the predicted porewater concentration in the bioturbation layer (C_{bio}) is related to the flux out of the chemical isolation layer by the following equation:

$$C_{bio} = Flux \left[\frac{1}{k_{bio} R_f + U} + \frac{1}{k_{bl} + U} \right]$$

where:

R_f = retardation factor for the movement of chemicals through the cap

U = Darcy velocity of the groundwater (feet per second).

5.4.1 Model Inputs and Assumptions

To calculate the overall flux noted above, the Reible et al. (2004) model requires the input values defined in Table 5-6 and Table 5-7. Conservative values were selected in all cases. Specific assumptions are described below.

The 95 percent UCLs of all available data for each COPC were calculated. These values were then converted into porewater concentrations assuming equilibrium partitioning conditions. The resulting partitioned porewater concentrations were input into the model as initial porewater concentrations (C_0) within the contained sediment.

5.4.1.1 Infinite Source Assumption/Zero Degradation

The underlying sediment was conservatively assumed to maintain the maximum estimated porewater concentration at all times, without any biodegradation or depletion during its movement through the cap. Thus, the anaerobic degradation rate was assumed to be zero (Table 5-7).

5.4.1.2 Seepage Velocities

The seepage velocities are a key variable in cap modeling, as they directly influence the time span over which chemical concentrations are expressed through the cap. For the planned Pier G Slip Fill containment berm, it has been assumed that a maximum differential hydrostatic head of 10 feet will occur during extreme low tide events, representing a typical vertical elevation difference between extreme high tide events and low tide events. This hydrostatic head difference reflects an extreme low-tide condition in which groundwater within the slip fill remains at a high-tide elevation and under such conditions would act as the driving force for porewater movement through the berm. Assuming porewater travels through the thinnest possible amount of berm material (estimated as 100 feet [per the typical berm cross section, as shown on Figure 3-3]), this amounts to an equivalent hydraulic gradient of 0.1. Assuming a maximum (most conservative) hydraulic conductivity (K) of 1.0×10^{-5} centimeters per second, and a maximum (most conservative) porosity of 0.5, the resulting prediction of seepage velocity (per Darcy's Law) is 63.1 centimeters per year. This value was used in the modeling.

5.4.1.3 Biodegradation Rates

Biodegradation rates were obtained from the Hazardous Substances Database available from the Toxicology Database Network (USNLM 2008). To be conservative, the slowest biodegradation rate provided from this source was used as input to the model.

5.4.1.4 Partitioning Coefficients

Porewater concentrations have not been directly measured at this site; therefore, partition coefficients (K_d) were used to calculate porewater concentrations in the confined sediment from the bulk chemistry data. These K_d values were obtained from the USEPA's *Soil Screening Guidance: Technical Background Document* (1996) and *A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture* (Baes 1984). The calculated porewater concentration in the confined sediment was used as the initial concentration entering the cap (C_0 , in mg/L; as presented in Table 5-7).

5.4.2 Model Results

Model results are summarized in Table 5-8. The time to reach steady-state chemical concentrations was predicted for each COPC, and the predicted steady-state concentrations expressed through the cap were compared to sediment and water quality guidelines with the resulting comparisons to quality guidelines expressed as a hazard quotient (HQ). HQ values less than 1 indicate that the guideline is not predicted to be exceeded under steady-state conditions in the surface of the berm. Values greater than 1 indicate potential toxicity to benthic organisms in or around the berm surface.

The results from Table 5-8 suggest that predicted HQs remain lower than 1, indicating that there are no anticipated exceedances of the stated criteria for the foreseeable future (time periods of several thousand years). In most cases, in fact, the long-term steady-state equilibrium condition for expressed porewater remains lower than the chronic water quality criteria.

The only indicated exception to this, a moderate exceedance for mercury in porewater (HQ of 1.20), is not predicted to occur for over 25,000 years, which is well beyond the range of any conceivable monitoring or measurable effects. These predictions are based on modeling assumptions that are inherently conservative. For example, the 95 percent UCL concentration of mercury was used as an input parameter, rather than its average concentrations. Revising this assumption alone would lead to the resulting long-term steady-state HQ for mercury being significantly lower than 1. Also as a reminder, degradation occurring within the rock portion of the dike is not accounted for in the model, which, if included, would certainly suggest even longer times to reach steady state if measured on the outside edge of the rock versus the inside edge of the rock.

In summary, the implications of these results are that even when worst-case, conservative assumptions are used to define inputs to the model, the Pier G Slip Fill containment berm is still predicted to be effective in isolating all contaminants in the long term.

6 CONTINGENCY MEASURES

6.1 Confirmation of Sufficient Sediment Removal

Confirmation sampling will be performed 24 to 48 hours after dredging is completed in each AOEC in order to verify successful removal of chemically impacted sediments. The sampling program will be designed to evaluate whether the remaining sediments meet SMO requirements or if additional dredging is necessary for compliance with the ROD. This confirmatory sampling program will be designed to have sufficient coverage and density of sampling points to ensure statistically meaningful results for COECs. Appendix E documents the development of a Confirmatory Sampling Plan for IR Site 7.

The results of the post-dredging confirmational sampling will be evaluated on an area-wide basis, and an area-weighted average will be determined to identify if any significant contaminants in excess of SMO cleanup standards remain after dredging. If so, then an additional dredging pass may be required over the area or areas where significant SMO exceedances were noted. The size of the re-dredging area will be determined based on a statistical evaluation of the results.

After the re-dredging is completed, the re-dredged area will be re-sampled. If sampling results still indicate SMO cleanup standards have not been met, then one or all of the following contingency measures may be undertaken depending on the sample results and the remaining capacity at the Pier G Slip Fill site at the time:

- Determine (by analyzing archived 20 to 40 centimeter sample depths) if the apparent contamination is related to dredging residuals only or if it extends into previously undredged materials.
- Decide on possible additional sampling to narrow down areas in which the contaminants may be present.
- An additional dredging pass may be conducted in an attempt to remove remaining contamination to achieve the SMOs.
- A second dredging pass may then be followed by another round of confirmational sampling.
- Place residuals sand cover over dredged areas to reduce the surficial concentrations and achieve SMOs (as provided by the ROD). This approach may be implemented if additional dredging is judged to be an inefficient means of addressing the issue.

6.2 Contingency Actions for Short-term Water Quality

Water quality will be monitored around the point of dredging and outside the Pier G Slip Fill containment berm. If water quality exceedances are noted during dredging or disposal operations, the contractor may choose any of the following contingency adjustments in order to ensure that water quality criteria are met:

- Adjust the sequence and/or speed of dredging and disposal operations
- Temporarily stop dredge or disposal operations until the water quality exceedance is no longer noted
- Reposition dredge or disposal operations in such a way as to ensure future exceedances do not occur
- Fix, maintain, and/or upgrade floating silt curtains
- Modify, either on a temporary or permanent basis, dredge equipment (such as the dredging bucket size or type)

7 CONCLUSIONS

This report describes environmental elements of the IR Site 7 sediment dredging project and documents how the proposed work will accomplish SMOs stipulated in the ROD.

In particular, this report documents the following environmental cleanup-related aspects of the proposed project:

- Planned extents and depths of dredging are consistent with the extents and depths of chemically contaminated sediments, as determined through previous site investigations.
- Regular surveying will be utilized during construction to ensure that dredging is accomplished to the required extents and depths.
- Confirmatory samples will be obtained after dredging is complete to determine if there is any significant remaining sediment that exceeds cleanup goals, in which case additional dredging (or other countermeasure) will be employed to mitigate the issue.
- Residual sediments are expected to be present on the seafloor after the completion of dredging but are predicted to contain chemical concentrations that are below cleanup goals for the site.
- Water quality impacts at the point of dredging and at the point of disposal were modeled and are predicted to be negligible at an expected compliance boundary of 300 feet. Nevertheless, water quality will be closely monitored throughout construction.

Therefore, the proposed project is consistent with the cleanup goals of the ROD, and the Port (and its consultants) will manage the construction process to make sure that all project requirements are met.

8 REFERENCES

- Anchor Environmental CA, L.P. 2003. Literature Review of Effects of Resuspended Sediments Due to Dredging Operations. Prepared for the Los Angeles Contaminated Sediments Task Force. Los Angeles, California. June 2003.
- Baes, C.F. 1984. A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture.
(<http://homer.ornl.gov/baes/documents/ornl5786.html>)
- Bechtel International, Inc (Bechtel). 1997. Final Remedial Investigation Report, Installation Restoration Site 7 (West Basin), Naval Station Long Beach. Long Beach, California. December 1997.
- Bechtel. 2003. Final Feasibility Study Report, Installation Restoration Site 7, Naval Station Long Beach.
- Desrosiers, R., C. Patmont, E. Appy, and P. LaRosa. 2005. Effectively Managing Dredging Residuals: Balancing Remedial Goals and Construction Costs. Proceedings of the Third International Conference on Remediation of Contaminated Sediments. Battelle Press. January 24 to 27, 2005. New Orleans, Louisiana.
- Hayes, D.F. and C.H. Je. 2000. "DRAFT: DREDGE Module User's Guide." July 2000.
- Johnson, B. H., D.N. McComas, D.C. McVan, and M.J. Trawle. 1994. Development and Verification of Numerical Models for Predicting the Initial Fate of Dredged Material Disposed in Open Water. Report 1, Physical Model Tests of Dredged Material Disposal from a Split-hull Barge and a Multiple Bin Vessel. Draft Technical Report, U.S. Army Engineer Waterways Experiment Station. Vicksburg, Mississippi.
- Los Angeles Region Contaminated Sediments Task Force (CSTF). 2002. Los Angeles Regional Dredged Material Management Plan Pilot Studies. Prepared for the U.S. Army Corps of Engineers, Los Angeles District.



- MEC Analytical Inc. 1999. Results of Chemical, Physical, and Biological Testing of Sediments Collected from the West Basin, Port of Long Beach. Port of Long Beach, California.
- Nakai, O. 1978. Turbidity Generated by Dredging Projects. Proceedings of the 3rd U.S./Japan Experts Meeting, U.S. Army Engineer Water Resources Support Center. Fort Belvoir, Virginia.
- Reible, D.D., C. Kiehl-Simpson, and A. Marquette. 2004. Modeling Chemical Fate and Transport in Sediment Caps. Technical Presentation 380-D. New York, NY: American Institute of Chemical Engineers.
- Risk Assessment Information System (RAIS). 2006. Risk Assessment Information System Database. <http://rais.ornl.gov/index.shtml>.
- Stern, J. and C.R. Patmont. 2006. Evaluation of Post-dredge Monitoring Results to Assess Net Risk Reduction of Different Sediment Cleanup Options. Presentation at the SETAC North America 27th Annual Meeting. November 5 to 9, 2006. Montreal, Canada.
- U.S. Army Corps of Engineers (USACE). 2008. The Four Rs of Environmental Dredging: Resuspension, Release, Residual, and Risk. Engineer Research and Development Center, Environmental Laboratory, Document ERDC/EL TR-08-4. Authors: T.S. Bridges, S. Ells, D. Hayes, D. Mount, S.C. Nadeau, M.R. Palermo, C. Patmont, and P. Schroeder. January 2008.
- U.S. Environmental Protection Agency (USEPA). 1996. Soil Screening Guidance (SSG): Technical Background Document. Document No. USEPA/540/R-95/128. <http://www.epa.gov/superfund/health/conmedia/soil/toc.htm#p5>.
- USEPA. 2007. Record of Decision, Installation Restoration Site 7 Operable Unit 3 Former Long Beach Naval Complex. Long Beach, California.
- U.S. National Library of Medicine (USNLM). 2008. Toxicology Database Network. <http://toxnet.nlm.nih.gov>.



Weston Solutions, Inc. 2007. Pre-Design Sediment Sampling. IR Site 7 (West Basin) Sediment Remediation Project. Port of Long Beach, California. July 2007.



TABLES

Table 1-1
West Basin Sediment Management Objectives

Contaminant	Final Sediment Management Objective
Copper	254 mg/kg
Lead	100 mg/kg
Mercury	0.9 mg/kg
Silver	3.5 mg/kg
Zinc	307 mg/kg
Total PAHs	5,400 µg/kg
Total PCBs	570 µg/kg
Total DDTs	210 µg/kg

Notes:

DDT = dichlorodiphenyltrichloroethane

PAH = polycyclic aromatic hydrocarbons

PCB = polychlorinated biphenyl

mg/kg = milligrams per kilogram

µg/kg = micrograms per kilogram

Table 2-1
Summary of Total Solids and Metals in AOEC-A 01 and AOEC-A 02 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels

Analyte	ERL	ERM	TTLC	LBNS SMOs	AOEC-A 01											AOEC-A 02										
					A-01 0-1	A-01 1-2	A-01 2-3	A-01 3-4	A-01 4-5	A-01 5-6	A-01 6-7	A-01 7-8	A-01 8-9	A-01 9-10	A-01 10-11	A-02 0-1	A-02 1-2	A-02 2-3	A-02 3-4	A-02 4-5	A-02 5-6	A-02 6-7	A-02 7-8	A-02 8-9	A-02 9-10	
General Chemistry																										
Solids, Total (%)					66.4	70.5	72.2	73.3	68.8	75.7	71.5	70	70.4	70.5	71.8	48.1	54.8	73	70	72.1	70.3	79.1	77.1	76.4	73.6	
Metals (mg/kg)																										
Arsenic	8.2	70	500	-	12.1	5.46	4.36	4.06	20.8	7.8	4.87	12.2	8.7	9.31	8.44	19.4	37.6	10.5	11.8	7.16	8.35	4.32	2.77	6.29	1.69	
Cadmium	1.2	9.6	100	-	0.654	<0.142	<0.139	<0.136	0.21	0.137	<0.140	0.152	<0.142	<0.142	<0.139	1.1	1.9	0.416	0.288	0.156	0.28	<0.126	<0.130	<0.131	<0.136	
Chromium	81	370	500	-	42.8B	21.1B	15.0B	17.7B	32.7B	29.2B	32.3B	41.7B	39.6B	40.2B	40.7B	87.8B	84.1B	33.5B	34.2B	22.6B	38.9B	15.5B	11.0B	20.0B	23.3B	
Copper	34	270	2500	254	177	25.4	8.56	11.6	45.7	32.8	36.8	42	38.7	40.2	43.3	337	568	603	64.8	50.5	103	27.1	7.53	23.6	29	
Lead	46.7	218	1000	100	151	28.3	2.38	2.92	10	6.4	6.98	9.22	8.27	8.55	8.67	116	133	83.6	18	10.5	21	5.46	2.21	6.44	4.68	
Mercury	0.15	0.71	20	0.9	0.722	0.0564	<0.0278	<0.0273	0.111	0.0812	<0.0280	0.0704	0.0686	0.0874	0.0698	0.635	3.04	1.45	0.166	0.109	0.13	0.0804	<0.0260	0.0859	0.0583	
Nickel	20.9	51.6	2000	-	23.5	13.8	10.3	12.6	26.5	23.7	26.5	30.9	28.1	29.5	29.3	42.8	43.9	20.2	25.8	17	19.9	11.4	8.91	17.9	22.2	
Selenium	-	-	100	-	0.872	<0.709	<0.693	0.77	1.05	1.02	1.06	1.7	1.33	1.45	1.35	<1.04	<0.912	<0.685	<0.714	<0.693	<0.711	<0.632	<0.649	<0.654	<0.679	
Silver	1	3.7	500	3.5	0.414	<0.142	<0.139	<0.136	<0.145	<0.132	<0.140	0.152	<0.142	<0.142	<0.139	0.966	1.06	0.222	0.154	<0.139	<0.142	<0.126	<0.130	<0.131	<0.136	
Zinc	150	410	500	307	243	68.9	36.4	47.5	87.2	88.4	92.5	106	96.2	100	99.4	377	423	145	126	72.9	145	46.7	28.9	54.7	72	

Notes:

All values in dry weight except where noted

bold = measured concentration exceeds the analyte's respective effects change low (ERL) value

bold and yellow = measured concentration exceeds the analyte's respective effects range median (ERM) value

bold and orange = measured concentration exceeds the analyte's respective Total Threshold Limit Concentration (TTLC) value

bold outline around cell = measured concentration exceeds the analyte's respective Long Beach Naval Station (LBNS) Sediment Management Objectives (SMOs) value

< = below the method detection limit indicated

B = analyte was present in associated method blank



Table 2-2
Summary of Total Solids and Metals in AOEC-A 03 and AOEC-A 04 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels

Analyte	ERL	ERM	TTLC	LBNS SMOs	AOEC-A 03										AOEC-A 04									
					A-03 0-1	A-03 1-2	A-03 2-3	A-03 3-4	A-03 4-5	A-03 5-6	A-03 6-7	A-03 7-8	A-03 8-9	A-03 9-10	A-02 0-1	A-04 1-2	A-04 2-3	A-04 3-4	A-04 4-5	A-04 5-6	A-04 6-7	A-04 7-8		
General Chemistry																								
Solids, Total (%)					67.1	68.4	58.9	76	73.6	74.6	76.7	72.4	71.8	71.5	48	49.7	61.8	61.6	65.7	67.9	71.8	75.3		
Metals (mg/kg)																								
Arsenic	8.2	70	500	-	11.3	15.4	21.8	3.74	2.75	2.33	1.96	1.58	1.45	1.54	19.9	28.1	11.1	21.3	15.9	11.2	9.56	9.9		
Cadmium	1.2	9.6	100	-	1.78	3.17	3.28	0.192	<0.136	0.216	<0.130	<0.138	<0.139	<0.140	0.983	1.95	1.01	0.969	0.306	0.199	0.217	0.222		
Chromium	81	370	500	-	126B	102B	145B	18.0B	20.0B	31.7B	23.7B	20.6B	17.8B	18.9B	82.9B	101B	55.9B	65.2B	41.8B	34.2B	30.8B	38.4B		
Copper	34	270	2500	254	365	440	377	29	22.7	39.6	25.7	21.6	20.1	16.6	234	430	309	228	54.2	36.4	44.5	50		
Lead	46.7	218	1000	100	449	283	422	32.8	8.06	11	6.63	4.3	3.94	3.43	87	111	71	59.2	16	10.2	11.4	12.1		
Mercury	0.15	0.71	20	0.9	0.199	0.325	0.763	0.0312	<0.0272	0.0987	0.143	0.0577	<0.0279	<0.0280	0.567	1.1	2.47	1.7	0.16	0.1	0.108	0.0597		
Nickel	20.9	51.6	2000	-	26.8	30.7	43.5	12.9	23.7	31	20.8	17.6	15.2	14.9	45.9	50.2	33.1	40.9	32.5	25.9	23.1	31.9		
Selenium	-	-	100	-	1.58	<0.731	<0.849	<0.658	<0.679	<0.670	<0.652	<0.691	<0.696	<0.699	<1.04	3.24	2.28	2.44	<0.761	<0.736	<0.696	<0.664		
Silver	1	3.7	500	3.5	0.43	1.57	0.894	<0.132	<0.136	<0.134	<0.130	<0.138	<0.139	<0.140	0.813	1.05	0.517	0.526	0.162	<0.147	<0.139	<0.133		
Zinc	150	410	5000	307	746	1020	1590	90.3	73.6	80.7	64.1	55.9	57.6	56.8	324	416	298	225	111	90.9	84.3	104		

Notes:

All values in dry weight except where noted

bold = measured concentration exceeds the analyte's respective effects change low (ERL) value

bold and yellow = measured concentration exceeds the analyte's respective effects range median (ERM) value

bold and orange = measured concentration exceeds the analyte's respective Total Threshold Limit Concentration (TTLC) value

bold outline around cell = measured concentration exceeds the analyte's respective Long Beach Naval Station (LBNS) Sediment Management Objectives (SMOs) value

< = below the method detection limit indicated

B = analyte was present in associated method blank

Table 2-3
Summary of Total Solids and Metals in AOEC-A 05 and AOEC-A 06 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values,
Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels

Analyte	ERL	ERM	TTLC	LBNS SMOs	AOEC-A 05										AOEC-A 06												
					A-05 0-1	A-05 1-2	A-05 2-3	A-05 3-4	A-05 4-5	A-05 5-6	A-05 6-7	A-05 7-8	A-05 8-9	A-05 9-10	A-05 10-11	A-06 0-1	A-06 1-2	A-06 2-3	A-06 3-4	A-06 4-5	A-06 5-6	A-06 6-7	A-06 7-8	A-06 8-9	A-06 9-10	A-06 10-11	
General Chemistry																											
Solids, Total (%)					56.9	61.1	62.1	57.5	64.2	55.1	68	63.6	64.1	70.5	74.9	55.5	55.8	54.9	67.4	76.7	78.4	76.5	71.6	70.1	70.7	72	
Metals (mg/kg)																											
Arsenic	8.2	70	500	-	20.6	14.9	12.8	15.7	15.9	19.3	13.6	17.2	13.4	8.36	11.3	22.3	30.6	17.8	13.4	5.66	9.47	6.99	8.03	10.4	9.42	9.9	
Cadmium	1.2	9.6	100	-	0.967	0.931	2.13	2.69	0.598	0.526	0.326	0.487	0.317	0.181	0.213	1.35	1.24	1.4	0.385	<0.130	0.147	<0.131	<0.140	<0.143	<0.141	<0.139	
Chromium	81	370	500	-	95.1B	69.4B	56.5B	49.3B	38.1B	45.7B	42.2B	44.2B	44.3B	28.8B	34.2B	75.2B	72.4B	60.4B	32.8B	15.4B	30.9B	28.8B	28.0B	28.8B	23.1B	33.6B	
Copper	34	270	2500	254	177	183	149	143	58.8	69.9	55.9	61.9	57	31.7	42.2	212	244	202	55.3	13.2	38.3	30.7	34.3	32.2	25.2	49.9	
Lead	46.7	218	1000	100	158	52.5	47.1	43.4	21.1	28.6	16.1	26.2	20	9.3	11.7	93.8	110	62.5	20.2	3.24	7.59	4.92	5.82	6.64	4.46	6.63	
Mercury	0.15	0.71	20	0.9	0.66	2	0.694	0.627	0.338	0.166	0.154	0.137	0.0698	0.0374	0.0495	0.605	0.901	1.2	0.108	0.156	0.0443	<0.0262	0.0322	<0.0286	<0.0283	<0.0278	
Nickel	20.9	51.6	2000	-	71.4	79.1	53.8	56.4	32.9	35.7	34.5	35.7	35.6	22.5	27.7	42.2	45.9	45.9	27.5	12.3	27	26.4	25.5	25.9	21.4	30.3	
Selenium	-	-	100	-	<0.879	<0.818	1.42	3.22	<0.779	1.28	<0.735	<0.786	<0.780	<0.709	<0.668	0.951	1.04	1.96	<0.742	<0.652	<0.638	<0.654	<0.698	<0.713	<0.707	<0.694	
Silver	1	3.7	500	3.5	0.519	0.378	0.462	0.752	0.255	0.312	0.171	0.253	0.193	<0.142	<0.134	0.807	0.756	0.747	0.212	<0.130	<0.128	<0.131	<0.140	<0.143	<0.141	<0.139	
Zinc	150	410	5000	307	348	198	185	504	117	131	118	130	121	76.2	88.2	303	314	230	103	42.6	82.7	77	80	80.2	69.1	90.2	

Notes:

All values in dry weight except where noted

bold = measured concentration exceeds the analyte's respective effects change low (ERL) value

bold and yellow = measured concentration exceeds the analyte's respective effects range median (ERM) value

bold and orange = measured concentration exceeds the analyte's respective Total Threshold Limit Concentration (TTLC) value

bold outline around cell = measured concentration exceeds the analyte's respective Long Beach Naval Station (LBNS) Sediment Management Objectives (SMOs) value

< = below the method detection limit indicated

B = analyte was present in associated method blank



Table 2-4
Summary of Total Solids and Metals in AOEC-A 07 and AOEC-C East 01 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels

Analyte	ERL	ERM	TTLC	LBNS SMOs	AOEC-A 07									AOEC-C East 01								
					A-07 0-1	A-07 1-2	A-07 2-3	A-07 3-4	A-07 4-5	A-07 5-6	A-07 6-7	A-07 7-8	A-07 8-9	CE-01 0-1	CE-01 1-2	CE-01 2-3	CE-01 3-4	CE-01 4-5	CE-01 5-6	CE-01 6-7	CE-01 7-8	
General Chemistry																						
Solids, Total (%)					54.6	57.3	58.3	69.5	75.6	76	76.4	76.3	76.1	54.9	65.9	68.7	63.7	77.4	74.7	74.7	71.1	
Metals (mg/kg)																						
Arsenic	8.2	70	500	-	15.7	25.8	20.1	12.7	6.4	5.35	4.12	4.39	5.2	19.4	10.1	9.43	12.7	6.17	5.32	12	13.7	
Cadmium	1.2	9.6	100	-	1.13	2.93	1.91	0.853	0.243	0.243	<0.131	<0.131	<0.131	0.819	0.312	0.438	0.605	<0.129	<0.134	0.164	0.297	
Chromium	81	370	500	-	59.6B	97.0B	86.0B	52.5B	35.6B	24.8B	20.4B	20.1B	27.1B	71.8B	37.9B	37.5B	43.5B	25.3B	16.4B	20.4B	27.4B	
Copper	34	270	2500	254	196	303	323	161	57.2	40.1	19.2	20.9	27.7	154	56.2	50.7	65.5	21	15.3	18.6	38.9	
Lead	46.7	218	1000	100	74.1	310	122	61.6	27	18.9	4.25	5.22	6.81	67.5	19.5	10.9	14.7	6.09	4.58	4.86	8.88	
Mercury	0.15	0.71	20	0.9	0.376	1.14	2.47	0.353	0.144	0.0883	<0.0262	<0.0263	0.0614	0.569	0.284	0.111	0.149	0.0656	0.0311	<0.0268	0.196	
Nickel	20.9	51.6	2000	-	36.4	51.6	45.4	35.1	31.7	20.4	17.5	17.9	24.1	41.3	26.1	29.7	35.1	19	13.4	16.7	23.8	
Selenium	-	-	100	-	0.978	1.07	1.37	1.01	<0.661	<0.658	<0.654	<0.655	<0.657	<0.911	<0.759	<0.728	<0.785	<0.646	<0.669	<0.669	<0.703	
Silver	1	3.7	500	3.5	0.589	1.43	0.833	0.37	<0.132	<0.132	<0.131	<0.131	<0.131	0.665	0.208	<0.146	0.168	<0.129	<0.134	<0.134	<0.141	
Zinc	150	410	5000	307	303	991	538	240	124	122	63.6	60.9	73.8	256	109	103	122	63.5	46.1	54.9	82.3	

Notes:

All values in dry weight except where noted

bold = measured concentration exceeds the analyte's respective effects change low (ERL) value

bold and yellow = measured concentration exceeds the analyte's respective effects range median (ERM) value

bold and orange = measured concentration exceeds the analyte's respective Total Threshold Limit Concentration (TTLC) value

bold outline around cell = measured concentration exceeds the analyte's respective Long Beach Naval Station (LBNS) Sediment Management Objectives (SMOs) value

< = below the method detection limit indicated

B = analyte was present in associated method blank



Table 2-5

Summary of Total Solids and Metals in AOEC-C East 02 and AOEC-C East 03 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels

Analyte	ERL	ERM	TTLC	LBNS SMOs	AOEC-C East 02								AOEC-C East 03							
					CE-02 0-1	CE-02 1-2	CE-02 2-3	CE-02 3-4	CE-02 4-5	CE-02 5-6	CE-02 6-7	CE-02 7-8	CE-03 0-1	CE-03 1-2	CE-03 2-3	CE-03 3-4	CE-03 4-5	CE-03 5-6	CE-03 6-7	CE-03 7-8
General Chemistry																				
Solids, Total (%)					59.3	62.8	74.4	73.3	71.1	71.2	70.8	70.8	61.7	66.2	72	72.6	73.3	78.5	76.9	75.1
Metals (mg/kg)																				
Arsenic	8.2	70	500	-	11.8	8.67	5.34	5.9	4.83	3.61	19.5	3.05	15.2	11.6	4.23	2.96	2.45	3.02	5.4	14.8
Cadmium	1.2	9.6	100	-	0.455	0.268	<0.134	<0.136	<0.141	0.73	<0.141	<0.141	0.562	0.399	<0.139	<0.138	0.443	0.152	<0.130	<0.133
Chromium	81	370	500	-	48.4B	32.5B	32.0B	27.4B	20.6B	40.2B	28.8B	20.3B	59.2B	44.9B	17.2B	18.9B	16.5B	13.3B	13.0B	14.6B
Copper	34	270	2500	254	106	35.2	36.1	35.4	22.3	55.8	36.9	21.5	101	67.7	10.9	21.8	16.8	12	13.1	14.8
Lead	46.7	218	1000	100	48.2	10.8	6.69	7.71	3.89	10.6	6.41	4.2	46	29.4	3.41	4.95	3.24	2.48	2.45	2.7
Mercury	0.15	0.71	20	0.9	0.403	0.188	0.0559	0.0586	0.0402	0.123	0.0495	<0.0283	0.384	0.157	0.0325	0.0478	0.0374	<0.0255	0.0332	<0.0267
Nickel	20.9	51.6	2000	-	28.2	24.2	28.7	23.7	18.8	33.2	25.1	17.5	36.4	28.9	12.1	14.8	13.5	11.9	11.4	12.6
Selenium	-	-	100	-	1.94	<0.796	<0.672	<0.682	<0.703	<0.702	<0.706	<0.706	<0.810	<0.755	<0.694	<0.689	<0.682	<0.637	<0.650	<0.666
Silver	1	3.7	500	3.5	0.447	<0.159	<0.134	<0.136	<0.141	0.382	<0.141	<0.141	0.449	0.303	<0.139	<0.138	<0.136	<0.127	<0.130	<0.133
Zinc	150	410	5000	307	183	85.9	89.1	80.6	59.9	113	76.5	57.3	209	139	47.2	54.5	47	34.3	40	45.7

Notes:

All values in dry weight except where noted

bold = measured concentration exceeds the analyte's respective effects change low (ERL) value

bold and yellow = measured concentration exceeds the analyte's respective effects range median (ERM) value.

bold and orange = measured concentration exceeds the analyte's respective Total Threshold Limit Concentration (TTLC) value

bold outline around cell = measured concentration exceeds the analyte's respective Long Beach Naval Station (LBNS) Sediment Management Objectives (SMOs) value

< = below the method detection limit indicated

B = analyte was present in associated method blank



Table 2-6
Summary of Total Solids and Metals in AOEC-C East 04 and AOEC-C East 05 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels

Analyte	ERL	ERM	TTLC	LBNS SMOs	AOEC-C East 04								AOEC-C East 05							
					CE-04 0-1	CE-04 1-2	CE-04 2-3	CE-04 3-4	CE-04 4-5	CE-04 5-6	CE-04 6-7	CE-04 7-8	CE-05 0-1	CE-05 1-2	CE-05 2-3	CE-05 3-4	CE-05 4-5	CE-05 5-6	CE-05 6-7	CE-05 7-8
General Chemistry																				
Solids, Total (%)					55.2	63.9	73.4	73.9	70.9	76.6	76	73.5	61.6	61.5	73.5	74.1	75.6	70.7	77.3	78.3
Metals (mg/kg)																				
Arsenic	8.2	70	500	-	18.4	20.3	7.49	7.89	4.66	2.84	2.47	8.1	16.1	16.8	5.67	2.49	3.29	2.38	1.8	1.64
Cadmium	1.2	9.6	100	-	0.737	0.936	0.308	0.196	<0.141	<0.131	<0.132	<0.136	0.505	0.441	0.141	<0.135	<0.132	<0.141	<0.129	<0.128
Chromium	81	370	500	-	72.2B	62.1B	30.5B	24.0B	23.7B	16.1B	13.4B	24.5B	60.3B	55.1B	18.7B	15.5B	14.0B	15.2B	14.3B	14.3B
Copper	34	270	2500	254	153	130	37	28.3	27.7	15.1	12.4	28.5	111	68.3	16.5	15.8	13.1	14.6	13.8	13.8
Lead	46.7	218	1000	100	74.9	63	18.2	8.54	6.43	3.09	2.77	4.35	55.9	22.9	6.77	4.08	2.6	3.45	2.91	2.75
Mercury	0.15	0.71	20	0.9	0.62	0.808	0.109	0.0723	0.375	0.191	<0.0264	<0.0273	0.426	0.228	0.0573	0.0406	<0.0265	0.0661	0.038	0.029
Nickel	20.9	51.6	2000	-	40.6	39.5	22.8	18.3	20.5	13.6	11	22.1	35	40.4	14.2	13.4	12	14	12.7	12.2
Selenium	-	-	100	-	1.09	1.17	<0.681	0.754	<0.705	<0.653	<0.658	<0.680	<0.812	1.4	<0.680	<0.675	<0.661	<0.707	<0.647	<0.639
Silver	1	3.7	500	3.5	0.665	0.676	0.181	<0.135	<0.141	<0.131	<0.132	<0.136	0.504	0.313	<0.136	<0.135	<0.132	<0.141	<0.129	<0.128
Zinc	150	410	5000	307	250	223	89.7	65.5	63.6	44.6	38.5	77.1	198	138	52.1	46.2	42.3	47.3	41.4	40.4

Notes:

All values in dry weight except where noted

bold = measured concentration exceeds the analyte's respective effects change low (ERL) value

bold and yellow = measured concentration exceeds the analyte's respective effects range median (ERM) value

bold and orange = measured concentration exceeds the analyte's respective Total Threshold Limit Concentration (TTLC) value

bold outline around cell = measured concentration exceeds the analyte's respective Long Beach Naval Station (LBNS) Sediment Management Objectives (SMOs) value

< = below the method detection limit indicated

B = analyte was present in associated method blank



Table 2-7
Summary of Total Solids and Metals in AOEC-C East 06 and AOEC-C East 07 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels

Analyte	ERL	ERM	TTLC	LBNS SMOs	AOEC-C East 06								AOEC-C East 07							
					CE-06 0-1	CE-06 1-2	CE-06 2-3	CE-06 3-4	CE-06 4-5	CE-06 5-6	CE-06 6-7	CE-06 7 8	CE-07 0-1	CE-07 1-2	CE-07 2-3	CE-07 3-4	CE-07 4-5	CE-07 5-6	CE-07 6-7	CE-07 7-8
General Chemistry																				
Solids, Total (%)					56.1	60.7	64.6	77	77.6	79.1	78	77.6	56.1	57.7	66.6	69.4	78.3	73.9	77.5	71.7
Metals (mg/kg)																				
Arsenic	8.2	70	500	-	15.4	15	15.2	2.61	2.48	1.59	1.22	1.17	19.4	21.5	11.2	8.22	1.69	2.44	1.04	4.45
Cadmium	1.2	9.6	100	-	0.52	0.661	0.425	<0.130	<0.129	<0.126	<0.128	<0.129	0.641	0.802	0.307	0.239	<0.128	<0.135	<0.129	0.234
Chromium	81	370	500	-	60.1B	51.9B	57.1B	17.9B	15.1B	12.7B	13.7B	12.5B	72.3B	67.8B	45.4B	33.6B	11.2B	13.2B	12.2B	40.2B
Copper	34	270	2500	254	112	97.1	65.1	17.9	13.4	13.1	13	11.4	152	134	51.6	39.4	9.91	11.5	12.3	50.1
Lead	46.7	218	1000	100	51.6	50.6	20.8	4.64	3.24	4.51	3.39	2.26	68.7	70.6	15.8	12.8	2.25	2.49	2.3	10.9
Mercury	0.15	0.71	20	0.9	0.464	0.625	0.155	0.126	0.0301	0.0502	0.0315	<0.0258	0.506	0.793	0.0795	0.0753	<0.0256	0.0278	0.0653	0.0876
Nickel	20.9	51.6	2000	-	34.8	31.4	41.6	13.8	11.9	11.6	11.7	15.9	39.8	40.8	34.1	26.5	9.32	11.3	10.8	33.1
Selenium	-	-	100	-	1.17	1.32	1.04	<0.649	<0.644	<0.632	<0.641	<0.644	1.39	1.2	0.786	<0.720	<0.639	<0.677	<0.645	0.832
Silver	1	3.7	500	3.5	0.509	0.481	0.258	<0.130	<0.129	<0.126	<0.128	<0.129	0.621	0.611	0.196	<0.144	<0.128	<0.135	<0.129	<0.139
Zinc	150	410	5000	307	192	228	144	49.6	42.3	39.4	40.6	46.3	251	257	120	95.8	33.1	38.5	38.1	112

Notes:

All values in dry weight except where noted

bold = measured concentration exceeds the analyte's respective effects change low (ERL) value

bold and yellow = measured concentration exceeds the analyte's respective effects range median (ERM) value

bold and orange = measured concentration exceeds the analyte's respective Total Threshold Limit Concentration (TTLC) value

bold outline around cell = measured concentration exceeds the analyte's respective Long Beach Naval Station (LBNS) Sediment Management Objectives (SMOs) value

< = below the method detection limit indicated

B = analyte was present in associated method blank



Table 2-8
Summary of Total Solids and Metals in AOEC-C East 08 and AOEC-C East 09 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels

Analyte	ERL	ERM	TTLC	LBNS SMOs	AOEC-C East 08								AOEC-C East 09							
					CE-08 0-1	CE-08 1-2	CE-08 2-3	CE-08 3-4	CE-08 4-5	CE-08 5-6	CE-08 6-7	CE-08 7-8	CE-09 0-1	CE-09 1-2	CE-09 2-3	CE-09 3-4	CE-09 4-5	CE-09 5-6	CE-09 6-7	CE-09 7-8
General Chemistry																				
Solids, Total (%)					57.7	64.9	77.1	76.5	72.6	68.6	74.8	74	53.1	58.2	60.9	76.1	75.6	75.3	76.5	76.5
Metals (mg/kg)																				
Arsenic	8.2	70	500	-	19.3	12.4	8.69	3.47	2.55	5.67	4.91	3.28	20.2	19.4	17.5	8.1	3.7	2.34	1.62	2.38
Cadmium	1.2	9.6	100	-	0.733	0.452	0.143	<0.131	<0.138	<0.146	<0.134	<0.135	0.867	0.575	0.516	0.164	<0.132	<0.133	<0.131	<0.131
Chromium	81	370	500	-	68.9B	42.0B	29.4B	19.7B	30.5B	28.6B	17.7B	17.3B	60.1B	49.3B	56.8B	25.2B	18.8B	20.5B	12.8B	21.6B
Copper	34	270	2500	254	133	65.4	29.3	19.5	35.4	33.2	18.5	17	149	82.5	76.5	26.3	23.2	20	13.5	23.4
Lead	46.7	218	1000	100	65.6	29.9	7.47	4.55	6.21	6.14	3.7	3.3	84.8	36.5	30	7.67	6.39	3.85	2.7	3.5
Mercury	0.15	0.71	20	0.9	0.347	0.173	0.0277	<0.0262	0.0336	<0.0292	<0.0268	<0.0271	0.881	0.23	0.181	0.0575	0.0539	<0.0266	<0.0262	0.043
Nickel	20.9	51.6	2000	-	40.5	26.9	22.1	16.1	27.4	24.7	15.2	14.7	36.2	37.6	40.2	20.2	15.6	17.3	11	17.3
Selenium	-	-	100	-	1.09	0.787	<0.649	<0.654	<0.689	<0.729	<0.668	<0.676	<0.942	<0.859	0.989	<0.657	<0.661	<0.664	<0.654	<0.654
Silver	1	3.7	500	3.5	0.594	0.299	<0.130	<0.131	<0.138	<0.146	<0.134	<0.135	0.627	0.35	0.317	<0.131	<0.132	<0.133	<0.131	<0.131
Zinc	150	410	5000	307	251	143	71.5	54.9	77	73.4	50.3	51.2	251	164	157	70	58.4	61.6	40.6	58

Notes:

All values in dry weight except where noted

bold = measured concentration exceeds the analyte's respective effects change low (ERL) value

bold and yellow = measured concentration exceeds the analyte's respective effects range median (ERM) value

bold and orange = measured concentration exceeds the analyte's respective Total Threshold Limit Concentration (TTLC) value

bold outline around cell = measured concentration exceeds the analyte's respective Long Beach Naval Station (LBNS) Sediment Management Objectives (SMOs) value

< = below the method detection limit indicated

B = analyte was present in associated method blank



Table 2-9
Summary of Total Solids and Metals in AOEC-C West 01 and AOEC-C West 02 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels

Analyte	ERL	ERM	TTLC	LBNS SMOs	AOEC-C West 01								AOEC-C West 02							
					CW-01 0-1	CW-01 1-2	CW-01 2-3	CW-01 3-4	CW-01 4-5	CW-01 5-6	CW-01 6-7	CW-01 7-8	CW-02 0-1	CW-02 1-2	CW-02 2-3	CW-02 3-4	CW-02 4-5	CW-02 5-6	CW-02 6-7	CW-02 7-8
General Chemistry																				
Solids, Total (%)					55.6	67.3	73.2	73.6	74.9	78	73.5	73.4	48.8	52.1	59	56.5	62.8	69.9	77.6	77
Metals (mg/kg)																				
Arsenic	8.2	70	500	-	11.8	7.05	3.13	8.5	3.83	7.9	5.43	6.35	16.7	22.8	13.8	10.4	7.02	1.38	2.4	1.41
Cadmium	1.2	9.6	100	-	0.439	0.234	<0.137	0.189	0.446	0.13	<0.136	<0.136	0.635	0.804	0.428	0.284	0.187	<0.143	<0.129	<0.130
Chromium	81	370	500	-	46.0B	25.1B	14.1B	24.8B	17.8B	15.8B	21.9B	18.0B	61.4B	61.6B	42.7B	33.8B	26.1B	7.79B	11.3B	22.4B
Copper	34	270	2500	254	87.7	37.5	9.01	32	29.5	20.7	27.3	23.8	132	129	60.3	40.2	32.6	8.91	11.3	23.7
Lead	46.7	218	1000	100	45.1	19.4	2.54	7.57	4.73	4.09	5.25	4.82	64.5	74.6	23.1	14.4	10.8	2.2	2.57	5.71
Mercury	0.15	0.71	20	0.9	0.568	0.139	<0.0274	0.0703	0.0421	0.445	0.045	0.0739	0.856	1.04	0.396	0.184	0.128	<0.0287	<0.0258	0.0321
Nickel	20.9	51.6	2000	-	26.9	16.1	10.7	24.1	16.5	15.3	20.9	17.9	35.7	35.8	33	26.2	20.8	7.89	10.3	19.3
Selenium	-	-	100	-	<0.899	<0.743	<0.683	<0.679	<0.668	<0.641	<0.680	<0.681	<1.02	<0.960	<0.847	<0.885	<0.796	<0.715	<0.644	<0.649
Silver	1	3.7	500	3.5	0.482	0.174	<0.137	<0.136	0.206	<0.128	<0.136	<0.136	0.59	0.67	0.25	<0.177	<0.159	<0.143	<0.129	<0.130
Zinc	150	410	5000	307	175	93.9	46.3	75.8	65.9	54.8	68.2	61.1	220	247	126	94.5	78.9	65.7	45.1	64.3

Notes:

All values in dry weight except where noted

bold = measured concentration exceeds the analyte's respective effects change low (ERL) value

bold and yellow = measured concentration exceeds the analyte's respective effects range median (ERM) value

bold and orange = measured concentration exceeds the analyte's respective Total Threshold Limit Concentration (TTLC) value

bold outline around cell = measured concentration exceeds the analyte's respective Long Beach Naval Station (LBNS) Sediment Management Objectives (SMOs) value

< = below the method detection limit indicated

B = analyte was present in associated method blank



Table 2-10
Summary of Total Solids and Metals in AOEC-C West 03 and AOEC-C West 04 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels

Analyte	ERL	ERM	TTLC	LBNS SMOs	AOEC-C West 03								AOEC-C West 04							
					CW-03 0-1	CW-03 1-2	CW-03 2-3	CW-03 3-4	CW-03 4-5	CW-03 5-6	CW-03 6-7	CW-03 7-8	CW-04 0-1	CW-04 1-2	CW-04 2-3	CW-04 3-4	CW-04 4-5	CW-04 5-6	CW-04 6-7	CW-04 7-8
General Chemistry																				
Solids, Total (%)					50.6	56.3	55.3	71.3	71.9	79.6	78.7	77.3	49.1	64.2	69.4	75.9	74.3	80.6	77.4	67.9
Metals (mg/kg)																				
Arsenic	8.2	70	500	-	12.2	14.4	16.9	3.08	10.5	8.74	5.17	3.61	14.6	11.3	3.54	5.13	5.78	4.57	5.04	6.19
Cadmium	1.2	9.6	100	-	0.439	0.567	0.662	<0.140	0.168	<0.126	<0.127	0.131	0.518	0.362	<0.144	<0.132	<0.135	<0.124	<0.129	<0.147
Chromium	81	370	500	-	53.1B	52.5B	49.8B	14.0B	34.7B	31.7B	19.8B	18.2B	57.3B	38.7B	14.5B	22.5B	28.1B	20.2B	21.9B	26.0B
Copper	34	270	2500	254	67.2	108	96	10.9	35.8	32.5	27.2	20.1	89.2	45.5	9.61	25	36.8	31.9	28.4	32.5
Lead	46.7	218	1000	100	34	54.4	49.9	2.94	11.6	10.8	5.95	5.8	42.6	21.8	2.85	7.49	8.82	6.07	6.96	6.25
Mercury	0.15	0.71	20	0.9	0.347	0.581	0.728	<0.0281	0.0609	0.0533	0.0486	0.0531	0.473	0.23	0.0544	0.0645	0.078	0.0448	0.188	0.0657
Nickel	20.9	51.6	2000	-	34.1	31.2	32.7	11	30.3	28.8	18.1	16.6	37.2	56.5	10.7	19.3	24.7	17.4	19.3	24.7
Selenium	-	-	100	-	<0.988	<0.888	<0.904	<0.701	<0.695	<0.628	<0.635	<0.647	<1.02	<0.779	<0.720	<0.659	<0.673	<0.620	<0.646	<0.736
Silver	1	3.7	500	3.5	0.34	0.528	0.56	<0.140	<0.139	<0.126	<0.127	<0.129	0.419	0.22	<0.144	<0.132	<0.135	<0.124	<0.129	<0.147
Zinc	150	410	5000	307	146	194	203	43.7	103	81.2	63.7	58.2	185	109	48.3	82.4	76.9	60.7	68.2	78.9

Notes:

All values in dry weight except where noted

bold = measured concentration exceeds the analyte's respective effects change low (ERL) value

bold and yellow = measured concentration exceeds the analyte's respective effects range median (ERM) value

bold and orange = measured concentration exceeds the analyte's respective Total Threshold Limit Concentration (TTLC) value

bold outline around cell = measured concentration exceeds the analyte's respective Long Beach Naval Station (LBNS) Sediment Management Objectives (SMOs) value

< = below the method detection limit indicated

B = analyte was present in associated method blank



Table 2-11
Summary of Total Solids and Metals in AOEC-C West 05 and AOEC-C West 06 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels

Analyte	ERL	ERM	TTLC	LBNS SMOs	AOEC-C West 05							AOEC-C West 06							
					CW-05 0-1	CW-05 1-2	CW-05 2-3	CW-05 3-4	CW-05 4-5	CW-05 5-6	CW-05 6-7	CW-06 0-1	CW-06 1-2	CW-06 2-3	CW-06 3-4	CW-06 4-5	CW-06 5-6	CW-06 6-7	CW-06 7-8
General Chemistry																			
Solids, Total (%)																			
Metals (mg/kg)																			
Arsenic	8.2	70	500	-	12.7	15.5	5.54	3.62	5.99	3.84	4.16	13.7	18.7	22.5	16.8	20.9	2.87	4.75	5.74
Cadmium	1.2	9.6	100	-	0.456	0.557	0.17	<0.148	0.243	<0.125	0.473	0.512	0.895	1.48	1.22	0.165	<0.142	<0.147	<0.146
Chromium	81	370	500	-	54.3	54.3	23.0B	16.0B	27.0B	20.6B	17.1B	64.4	73.1	75	51.7	29.5	20.1	19.7	25.6
Copper	34	270	2500	254	64.2	111	24.6	10.1	25	25.2	24.5	98.9	168	200	148	32	20.8	23.4	49.6
Lead	46.7	218	1000	100	32.4	58	12.7	2.95	6.88	5.16	5.09	46.1	79.7	98.6	70.2	7.92	4.35	4.82	8.67
Mercury	0.15	0.71	20	0.9	0.237	0.697	0.0792	<0.0297	0.0524	0.0528	0.125	0.44	0.485	1.46	0.943	0.0746	0.0419	0.0353	0.0697
Nickel	20.9	51.6	2000	-	48.8	30.2	14.5	11.4	23.1	18	43.9	39.7	40.3	38.8	27.4	24.9	16.5	17.9	22.5
Selenium	-	-	100	-	<1.00	<0.803	<0.799	<0.741	<0.697	<0.625	<0.670	<1.15	<1.03	<0.935	<0.702	<0.762	<0.709	<0.733	<0.732
Silver	1	3.7	500	3.5	0.301	0.551	<0.160	<0.148	<0.139	<0.125	0.323	0.449	0.744	0.919	0.705	0.222	<0.142	<0.147	0.23
Zinc	150	410	5000	307	142	204	75.6	48.3	102	66.2	55.9	195	271	326	242	77.2	59.2	61.4	72.5

Notes:

All values in dry weight except where noted

bold = measured concentration exceeds the analyte's respective effects change low (ERL) value

bold and yellow = measured concentration exceeds the analyte's respective effects range median (ERM) value

bold and orange = measured concentration exceeds the analyte's respective Total Threshold Limit Concentration (TTLC) value

bold outline around cell = measured concentration exceeds the analyte's respective Long Beach Naval Station (LBNS) Sediment Management Objectives (SMOs) value

< = below the method detection limit indicated

B = analyte was present in associated method blank

Table 2-12
Summary of Total Solids and Metals in AOEC-C West 07 and AOEC-C West 08 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels

Analyte	ERL	ERM	TTLC	LBNS SMOs	AOEC-C West 07							AOEC-C West 08							
					CW-07 0-1	CW-07 1-2	CW-07 2-3	CW-07 3-4	CW-07 4-5	CW-07 5-6	CW-08 6-7	CW-08 0-1	CW-08 1-2	CW-08 2-3	CW-08 3-4	CW-08 4-5	CW-08 5-6	CW-08 6-7	CW-08 7-8
General Chemistry																			
Solids, Total (%)																			
Metals (mg/kg)																			
Arsenic	8.2	70	500	-	12.2	12.7	13.8	6	5.86	10.7	10.6	18.2	5.9	4.22	6.94	7	7.45	6.36	8.55
Cadmium	1.2	9.6	100	-	0.497	0.467	0.518	0.173	<0.141	0.19	0.165	0.335	0.176	<0.149	<0.136	<0.131	<0.130	<0.135	<0.129
Chromium	81	370	500	-	58.9	54.7	46.3	26.2	25.4	36.2	27.5	21.2	26.0B	19.6B	26.9B	28.4B	19.2B	16.8	20.9
Copper	34	270	2500	254	74.4	71.8	84	26.5	22.2	35.8	28.4	27	28.9	16.5	25.8	28.1	19.1	17.8	20.2
Lead	46.7	218	1000	100	34.5	36.1	42.3	10.9	6.12	8.89	7.43	7.86	12.6	6.33	5.09	5.74	4.39	3.62	4.81
Mercury	0.15	0.71	20	0.9	0.259	0.503	0.495	0.075	0.0443	0.163	0.0594	0.118	0.109	<0.0299	0.0526	0.0563	<0.0261	<0.0270	0.0569
Nickel	20.9	51.6	2000	-	36.4	34.3	26.9	17.2	19	26.6	20.8	18.4	22.4	14	22.8	23.6	16.1	16.1	16.5
Selenium	-	-	100	-	<0.942	<0.828	<0.784	<0.699	<0.705	<0.726	<0.633	<0.698	<0.781	<0.745	<0.682	<0.655	<0.652	<0.675	<0.643
Silver	1	3.7	500	3.5	0.351	0.358	0.421	<0.140	<0.141	<0.145	<0.127	<0.140	<0.156	<0.149	<0.136	<0.131	<0.130	<0.135	<0.129
Zinc	150	410	5000	307	160	147	160	73.4	69.1	89.7	72	64.7	80.9	60.7	76.6	89.4	56.6	60.1	57.6

Notes:

All values in dry weight except where noted

bold = measured concentration exceeds the analyte's respective effects change low (ERL) value

bold and yellow = measured concentration exceeds the analyte's respective effects range median (ERM) value

bold and orange = measured concentration exceeds the analyte's respective Total Threshold Limit Concentration (TTLC) value

bold outline around cell = measured concentration exceeds the analyte's respective Long Beach Naval Station (LBNS) Sediment Management Objectives (SMOs) value

< = below the method detection limit indicated

B = analyte was present in associated method blank



Table 2-13
Summary of Total Solids and Metals in AOEC-C West 09 and AOEC-C West 10 and a Comparison to Published Effects Range Low and Effects Range Median Sediment Quality Values, Long Beach Naval Station Sediment Management Objectives, and Total Threshold Limit Concentration Regulatory Levels

Analyte	ERL	ERM	TTLC	LBNS SMOs	AOEC-C West 09							AOEC-C West 10							
					CW-09 0-1	CW-09 1-2	CW-09 2-3	CW-09 3-4	CW-09 4-5	CW-09 5-6	CW-09 6-7	CW-10 0-1	CW-10 1-2	CW-10 2-3	CW-10 3-4	CW-10 4-5	CW-10 5-6	CW-10 6-7	CW-10 7-8
General Chemistry																			
Solids, Total (%)					53	62.6	60.3	61.5	65.6	76.3	64	54	51.6	50.8	51.5	53.3	68.3	79.1	74.2
Metals (mg/kg)																			
Arsenic	8.2	70	500	-	14.7	12.8	8.11	4.44	3.68	3.62	4.46	14	16.5	23.2	29.8	12	7.78	12.9	6.08
Cadmium	1.2	9.6	100	-	0.535	0.457	0.258	<0.163	<0.152	<0.131	<0.156	0.477	0.655	1.13	2.16	0.992	0.158	0.199	<0.135
Chromium	81	370	500	-	64.0B	56.0B	31.4B	17.9B	16.4B	22.4B	25.3B	67.1B	75.6B	89.6B	95.6B	52.2B	27.9B	38.3B	31.4B
Copper	34	270	2500	254	73	73.1	40.6	12.5	12	22.9	29.9	93.8	94.5	238	267	121	36	50.8	43.1
Lead	46.7	218	1000	100	32.8	32.9	16.8	3.98	2.8	4.63	5.5	41.1	45	99.5	148	91.7	11.1	11.3	8.7
Mercury	0.15	0.71	20	0.9	0.202	0.226	0.645	<0.0326	0.0888	0.0285	0.0485	0.356	0.291	1.22	1.6	0.423	0.352	0.13	0.0885
Nickel	20.9	51.6	2000	-	42.4	35.4	19.8	13	13.2	19.9	22.3	49.6	47.1	46.7	67.1	38.8	24.5	72.2	25.8
Selenium	-	-	100	-	1.22	0.879	<0.829	<0.813	<0.762	<0.655	<0.781	<0.926	1.16	1.53	1.77	<0.938	<0.732	0.755	<0.674
Silver	1	3.7	500	3.5	0.317	0.315	0.169	<0.163	<0.152	<0.131	<0.156	0.392	0.445	0.972	1.19	0.682	<0.146	0.135	<0.135
Zinc	150	410	5000	307	164	151	103	53.9	58.9	70.8	76.6	193	193	357	457	248	83.5	97.6	97.1

Notes:

All values in dry weight except where noted

bold = measured concentration exceeds the analyte's respective effects change low (ERL) value

bold and yellow = measured concentration exceeds the analyte's respective effects range median (ERM) value

bold and orange = measured concentration exceeds the analyte's respective Total Threshold Limit Concentration (TTLC) value

bold outline around cell = measured concentration exceeds the analyte's respective Long Beach Naval Station (LBNS) Sediment Management Objectives (SMOs) value

< = below the method detection limit indicated

B = analyte was present in associated method blank



Table 2-14
IR Site 7 – West Basin Soluble Threshold Limit Concentrations Chemistry Results

Core Number	Core Horizon (feet)	Analyte	Total Metals (mg/kg d/w)	STLC (mg/L)	STLC Limits (mg/L)	TTLC Limits (mg/L w/w)
A-02	2 to 3	Copper	603	ND (0.0500)	25	2500
		Lead	83.6	1.14	5	1000
		Mercury	1.45	ND (0.00500)	0.2	20
		Chromium	33.5 (1)	0.369	560	2500
A-03	1 to 2	Copper	440	ND (0.0500)	25	2500
		Lead	283	ND (0.100)	5	1000
		Mercury	0.325	ND (0.00500)	0.2	20
		Chromium	102 (1)	1.01	560	2500
A-03	0 to 1	Copper	365	ND (0.0500)	25	2500
		Lead	449	0.571	5	1000
		Mercury	0.199	ND (0.00500)	0.2	20
		Chromium	126 (1)	1.25	560	2500
A-07	1 to 2	Copper	303	ND (0.0500)	25	2500
		Lead	310	ND (0.100)	5	1000
		Mercury	1.14	ND (0.00500)	0.2	20
		Chromium	97 (1)	0.83	560	2500
A-02	1 to 2	Copper	568	0.133	25	2500
		Lead	133	1.49	5	1000
		Mercury	3.04	ND (0.00500)	0.2	20
		Chromium	84.1 (1)	0.778	560	2500
A-04	2 to 3	Copper	309	ND (0.0500)	25	2500
		Lead	71	0.27	5	1000
		Mercury	2.47	ND (0.00500)	0.2	20
		Chromium	55.9 (1)	0.263	560	2500

Notes:

Total metals tested according to EPA 6020; STLC according to USEPA 6010B/EPA 7470A

Total metals tested in 6/07; STLC tested in 8/08

(1) = analyte also detected in method blank

STLC = Soluble Threshold Limit Concentration

TTLC = Total Threshold Limit Concentration

mg/kg d/w = milligrams per kilograms dry weight

mg/L = milligrams per liter

mg/L w/w = milligrams per liter wet weight

ND = Non-detect



Table 3-1
Estimated Dredge Sediment Volumes

Dredge Area	Acreage (acres)	Depth of Remedial Dredging (feet)	Allowed Contractor Overdepth (feet)	Approximate Dredge Volume (cy)
AOEC-A	16.33	4	2	181,000
AOEC-C West	33.20	4	2	371,000
AOEC-C East	33.38	2	2	248,000
Total				800,000

Table 5-1
**Summary of Physical and Chemical Analysis of IR Site 7 Project Sediment Elutriates and Site Water and
a Comparison to California Ocean Plan Water Quality Objections**

Analyte	Daily Maximum Criteria California Ocean Plan	IR Site 7 Water	AOEC-A Elutriate	AOEC-C East Elutriate	AOEC-C West Elutriate
Metals (mg/L)					
Arsenic	0.032	<0.0010	0.00944	0.00718	0.00579
Cadmium	0.004	<0.0010	<0.0010	<0.0010	<0.0010
Chromium	0.008	0.0072	0.00259	0.00383	0.00281
Copper	0.012	0.0024	0.00104	<0.0010	<0.0010
Lead	0.008	<0.0010	<0.0010	<0.0010	<0.0010
Mercury	0.00016	<0.0000177	<0.0000177	<0.0000177	<0.0000177
Nickel	0.02	0.0012	0.00123	<0.0010	<0.0010
Selenium	0.06	<0.0010	<0.0010	<0.0010	<0.0010
Silver	0.0028	<0.0010	<0.0010	<0.0010	<0.0010
Zinc	0.08	<0.0050	<0.0050	<0.0050	<0.0050
Pesticides (µg/L)					
2,4'-DDD	-	<0.050	<0.050	<0.050	<0.050
2,4'-DDE	-	<0.050	<0.050	<0.050	<0.050
2,4'-DDT	-	<0.050	<0.050	<0.050	<0.050
4,4'-DDD	-	<0.050	<0.050	<0.050	<0.050
4,4'-DDE	-	<0.050	<0.050	<0.050	<0.050
4,4'-DDT	-	<0.050	<0.050	<0.050	<0.050
PAHs (µg/L)					
1-Methylnaphthalene	-	<1.0	<1.0	<1.0	<1.0
2-Methylnaphthalene	-	<1.0	<1.0	<1.0	<1.0
Acenaphthene	-	<1.0	<1.0	<1.0	<1.0
Acenaphthylen	-	<1.0	<1.0	<1.0	<1.0
Anthracene	-	<1.0	<1.0	<1.0	<1.0



Table 5-1
Summary of Physical and Chemical Analysis of IR Site 7 Project Sediment Elutriates and Site Water and
a Comparison to California Ocean Plan Water Quality Objections

Analyte	Daily Maximum Criteria California Ocean Plan	IR Site 7 Water	AOEC-A Elutriate	AOEC-C East Elutriate	AOEC-C West Elutriate
Benzo (a) Anthracene	-	<1.0	<1.0	<1.0	<1.0
Benzo (a) Pyrene	-	<1.0	<1.0	<1.0	<1.0
Benzo (b) Fluoranthene	-	<1.0	<1.0	<1.0	<1.0
Benzo (g,h,i) Perylene	-	<1.0	<1.0	<1.0	<1.0
Benzo (k) Fluoranthene	-	<1.0	<1.0	<1.0	<1.0
Chrysene	-	<1.0	<1.0	<1.0	<1.0
Dibenz (a,h) Anthracene	-	<1.0	<1.0	<1.0	<1.0
Fluoranthene	-	<1.0	<1.0	<1.0	<1.0
Fluorene	-	<1.0	<1.0	<1.0	<1.0
Indeno (1,2,3) Pyrene	-	<1.0	<1.0	<1.0	<1.0
Naphthalene	-	<1.0	<1.0	<1.0	<1.0
Phenanthrene	-	<1.0	<1.0	<1.0	<1.0
Pyrene	-	<1.0	<1.0	<1.0	<1.0
Total PAHs	-	0.0	0.0	0.0	0.0
Aroclors (µg/L)					
Aroclor-1016	-	<0.50	<0.50	<0.50	<0.50
Aroclor-1221	-	<0.50	<0.50	<0.50	<0.50
Aroclor-1232	-	<0.50	<0.50	<0.50	<0.50
Aroclor-1248	-	<0.50	<0.50	<0.50	<0.50
Aroclor-1254	-	<0.50	<0.50	<0.50	<0.50
Aroclor-1260	-	<0.50	<0.50	<0.50	<0.50

Notes:

bold = the measured concentration exceeds the analyte's respective daily maximum criteria

mg/L = milligrams per liter

µg/L= micrograms per liter



Table 5-2
Input Parameters Used in DREDGE Modeling

Variable	Value Used												
	Unit	AOEC-A				AOEC-C East				AOEC-C West			
		A1	A2	A3	A4	CE1	CE2	CE3	CE4	CW1	CW2	CW3	CW4
Bucket Size	cy	12	12	8	8	12	12	8	8	12	12	8	8
Cycle Time	sec	60	60	60	60	60	60	60	60	60	60	60	60
Settling Velocity ¹	ft/sec	0.01	0.01	0.01	0.01	0.055	0.055	0.055	0.055	0.014	0.014	0.014	0.014
Dry Density	lb/ft ³	75.97	75.97	75.97	75.97	75.97	75.97	75.97	75.97	75.97	75.97	75.97	75.97
Turbidity Generation Unit (TGU) ²	lb/ft ³	5556.1	5556.1	5556.1	5556.1	5556.1	5556.1	5556.1	5556.1	5556.1	5556.1	5556.1	5556.1
Fraction of Particles < 74 μm ³		0.56	0.56	0.56	0.56	0.32	0.32	0.32	0.32	0.51	0.51	0.51	0.51
Fraction of Particles < Critical Settling Velocity		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Dredge Depth	ft	50	55	50	55	45	48	45	48	35	49	35	49
Lateral Diffusion Coefficient	ft ² /sec	1076.4	1076.4	1076.4	1076.4	1076.4	1076.4	1076.4	1076.4	1076.4	1076.4	1076.4	1076.4
Vertical Diffusion Coefficient	ft ² /sec	.00538	.00538	.00538	.00538	.00538	.00538	.00538	.00538	.00538	.00538	.00538	.00538
Ambient Water Velocity ⁴	ft/sec	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3
Mean Particle Size ³	μm	60	60	60	60	150	150	150	150	75	75	75	75
Specific Gravity		2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57

Notes:

1. Value is calculated by the DREDGE program based on Stokes' Law, using mean grain size from each sediment source
2. Based on literature values applicable to use of 8-cy bucket, as presented in Nakai (1978)
3. Determined using the results of sediment sampling and grain size testing (Weston 2007)
4. Assumed value for ambient current conditions due to intertidal exchange



Table 5-3
Key Input Parameters Used in STFATE Modeling

Parameter	Unit	AOEC-A	AOEC-C West
Site Description			
Number of Grid Points in Z-Dir		18	18
Number of Grid Points in X-Dir		30	30
Spacing Between Grid Points	ft	50	50
Density of Water (constant with depth)	g/cm ³	1.023	1.023
Water Depth in Disposal Area	ft	48	37
Material Description			
Volume of Each Layer of Placed Sediments	cy	181,000	248,000
Number of Solids Fractions in Material		3	3
Characteristics of Material that Falls in Clumps			
Specific Gravity		1.6	1.6
Fall Velocity	ft/sec	3	3
Void Ratio After Deposition		0.4	0.4
Volumetric Concentration of Total Solids	%	0.25	0.25
Characteristics of Material Sand Fraction			
Specific Gravity		2.7	2.7
Fall Velocity	ft/sec	0.1	0.1
Void Ratio After Deposition		0.6	0.6
Volumetric Concentration of Total Solids	%	0.11	0.125
Characteristics of Material Fines Fraction			
Specific Gravity		2.65	2.65
Fall Velocity	ft/sec	0.01	0.01
Void Ratio After Deposition		4.5	4.5
Volumetric Concentration of Total Solids	%	0.14	0.125
Length of Disposal Vessel (split-hull dump scow)	ft	200	200
Width of Disposal Vessel (split-hull dump scow)	ft	50	50
Pre-disposal Draft of Disposal Vessel	ft	16	16
Post-disposal Draft of Disposal Vessel	ft	8	8
Time Needed to Empty Disposal Vessel	sec	30	30

Table 5-4
Estimated Residual Layer Thickness

Dredge Area	Estimated Thickness of Residual Sediment Layer (inches)	
	Assuming 2 Percent of Sediment Mass Remains as Residual Layer	Assuming 6 Percent of Sediment Mass Remains as Residual Layer
AOEC-A	2	6
AOEC-C East	1	4
AOEC-C West	2	6

Table 5-5
Sediment Management Objective Limits and Calculated 95 Percent Upper Confidence Limits

Contaminant	Final SMO	95% UCL AOEC-A (HQ ¹)	95% UCL AOEC-C East (HQ ¹)	95% UCL AOEC-C West (HQ ¹)
Copper	254 mg/kg	149 mg/kg (0.59)	55 mg/kg (0.22)	66 mg/kg (0.26)
Lead	100 mg/kg	73 mg/kg (0.73)	22 mg/kg (0.22)	29 mg/kg (0.29)
Mercury	0.9 mg/kg	0.59 mg/kg (0.66)	0.22 mg/kg (0.24)	0.3 mg/kg (0.33)
Silver	3.5 mg/kg	0.4 mg/kg (0.11)	0.3 mg/kg (0.08)	0.3 mg/kg (0.08)
Zinc	307 mg/kg	261 mg/kg (0.85)	133 mg/kg (0.43)	133 mg/kg (0.43)
Total PAH	5400 µg/kg	ND (528 µg/kg) ²	ND (512 µg/kg) ²	ND (512 µg/kg) ²
Total PCBs	570 µg/kg	ND (128 µg/kg) ³	ND (128 µg/kg) ³	ND (128 µg/kg) ³
Total DDT	210 µg/kg	ND (9.6 µg/kg) ⁴	ND (9.6 µg/kg) ⁴	ND (9.6 µg/kg) ⁴

Notes:

1. HQ = hazard quotient, defined as the stated concentration divided by the applicable SMO
2. A total of 16 PAHs were analyzed. None, however, was detected. The detection limit for each analyte was 33 micrograms per kilogram (µg/kg) in AOEC-A and 32 µg/kg in AOEC-C East and West; therefore, the maximum potential total PAH value for each area is 528 µg/kg, 512 µg/kg, and 512 µg/kg, respectively.
3. A total of eight aroclors were analyzed. None, however, was detected. The detection limit for each was 16 µg/kg; therefore, the maximum potential total PCB value for each of the three areas is 128 µg/kg.
4. The detection limit for each of the DDT derivatives (4,4-DDT, 2,4-DDT, 4,4-DDE, 2,4-DDE, 4,4-DDD, and 2,4-DDD) was 1.6 µg/kg. The maximum potential total DDT result is, therefore, 9.6 µg/kg. No DDT derivatives were detected.

All chemistry results from Weston (2007).



Table 5-6
Summary of Physical Input Parameters for Chemical Isolation Modeling

Symbol	Value	Units	Comments
L_{eff}	70	ft	Effective width of containment berm, which acts as the chemical isolation layer; the minimum distance through which porewater must travel before entering the surrounding environment
ϵ_0	0.4	unitless	Porosity of cap sediments; 0.4 is a typical value for imported sand materials
ϵ_s	0.5	unitless	Porosity of underlying sediments
SG	2.5	g/cm ³	Specific gravity of cap sediment particles (typical value)
P_b	1.5	g/cm ³	Bulk sediment density of cap sediments calculated as $P_b = (1 - \epsilon) * SG$
foc	0.01	percent	Fraction of organic carbon in cap material
I	0.1	ft/ft	Estimated hydraulic gradient in surrounding sediment (for computing seepage velocity) ¹
K	1.00E-05	cm/sec	Estimated hydraulic conductivity in surrounding sediment (for computing seepage velocity) ¹ ; to be conservative, the upper range was used

Notes:

1. Seepage velocity estimated by $K*I/\epsilon_s = 63.1$ cm/yr.

Table 5-7
Summary of Chemical Input Parameters for Chemical Isolation Modeling

Chemical	$\text{Log}_{10}K_d$ ¹	Molecular Diffusion Coefficient (cm ² /yr) ²	95 Percent UCL of Detected Concentration of Confined Sediment (mg/kg)	Calculated Porewater Concentration in Confined Sediment = C_o (mg/L) ³	Ratio of Porewater Concentration to Chronic Water Quality Criteria ⁴	Minimum Reported Anaerobic Biodegradation Rate (year) ⁵
Copper	1.54	435	92.1	2.63	2.0	0
Lead	2.95	212	42.9	0.048	5.9	0
Mercury	2.30	215	0.4	0.002	38.6	0
Silver	2.04	306	0.3	0.003	1.5	0
Zinc	2.72	427	173.5	0.33	4.0	0

Notes:

1. K_d values from *Soil Screening Guidance: Technical Background Document* (USEPA 1996) and *A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture* (Baes 1984).
2. Molecular diffusion coefficients were developed from a best fit relationship based on diffusion rates in the Risk Assessment Information System database (RAIS 2006).
3. Calculated as the underlying bulk sediment concentration divided by K_d
4. See Table 5-1 for chronic water quality criteria
5. It was conservatively assumed that metals do not biodegrade.



Table 5-8
Summary of Chemical Isolation Layer Modeling Steady-state Results Under
Nominal Seepage Velocity Scenario

Chemical	Time to reach Steady-state Conditions (years)	Porewater Concentration (C_{bio}) at Steady State (mg/L)	Chronic Water Quality Criteria (mg/L)	Porewater HQ	Sediment Concentration (C_{bio}) at Steady State (mg/kg)	Sediment Cleanup Standards for LBNS SMO (mg/kg)	Sediment HQ
Arsenic	3,971	0.027	0.036	0.75	0.84	NA	N/A
Chromium	107,984	0.001	0.05	0.01	0.44	NA	N/A
Copper	4,479	0.190	1.3	0.15	6.65	254	0.03
Lead	114,334	0.000	0.0081	0.06	0.43	100	0.004
Mercury	25,434	0.0001	0.000051	1.20	0.01	0.9	0.01
Selenium	313	0.050	0.071	0.71	0.11	NA	N/A
Silver	14,004	0.000	0.0019	0.07	0.01	3.5	0.004
Zinc	67,344	0.005	0.081	0.06	2.62	307	0.01

Notes:

N/A = not applicable

mg/kg = milligrams per kilogram

µg/kg = micrograms per kilogram

HQ = hazard quotient

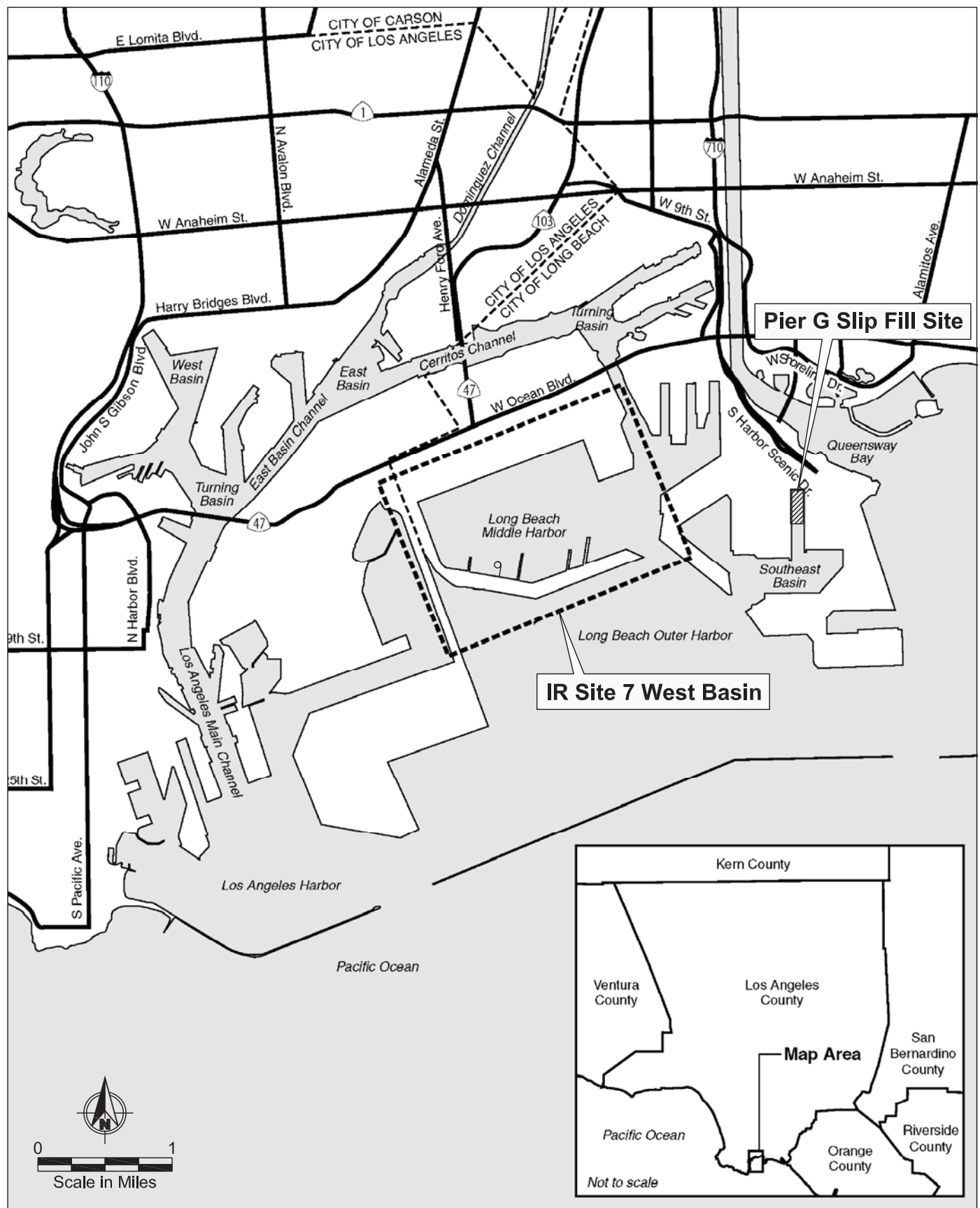
LBNS = Long Beach Naval Station

SMO = Sediment Management Objective

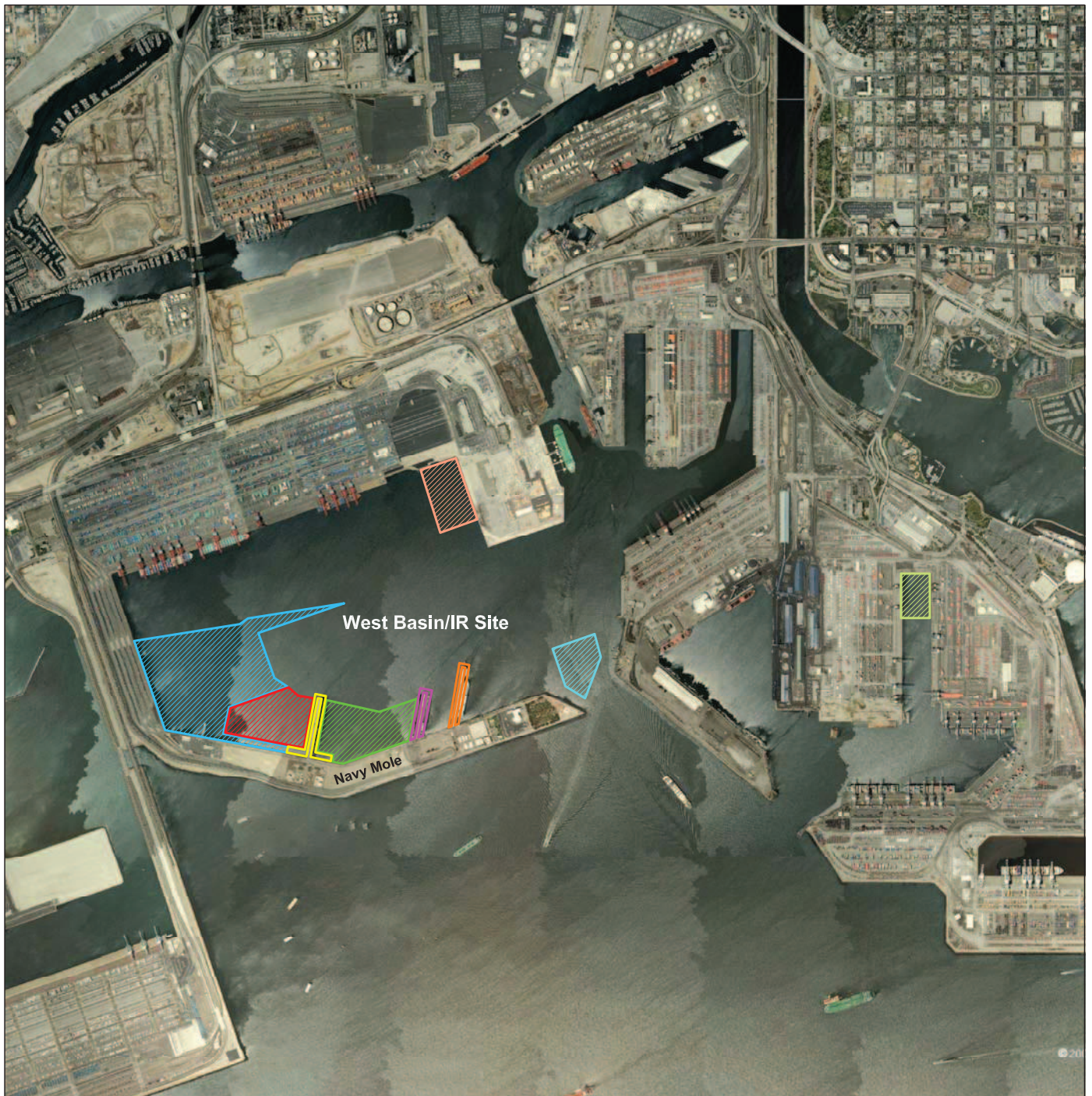


FIGURES

K:\Jobs\060343-Port of Long Beach-West Basin\060343-01\06034301-003.dwg F1-1
 Apr 02, 2009 3:09pm heriksen



Note: Drawing prepared from file provided by the Port of Long Beach.



Source: Aerial photo from Google Earth Pro, 2008.

Project Locations

- | | | | |
|-------------------------------------------------------------------------------------|-------------|-------------------------------------------------------------------------------------|-----------------------|
|  | AOEC A |  | AOEC D |
|  | AOEC B |  | AOEC E |
|  | AOEC C East |  | AOEC F |
|  | AOEC C West |  | Pier G Slip Fill Site |

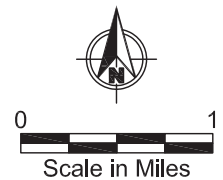
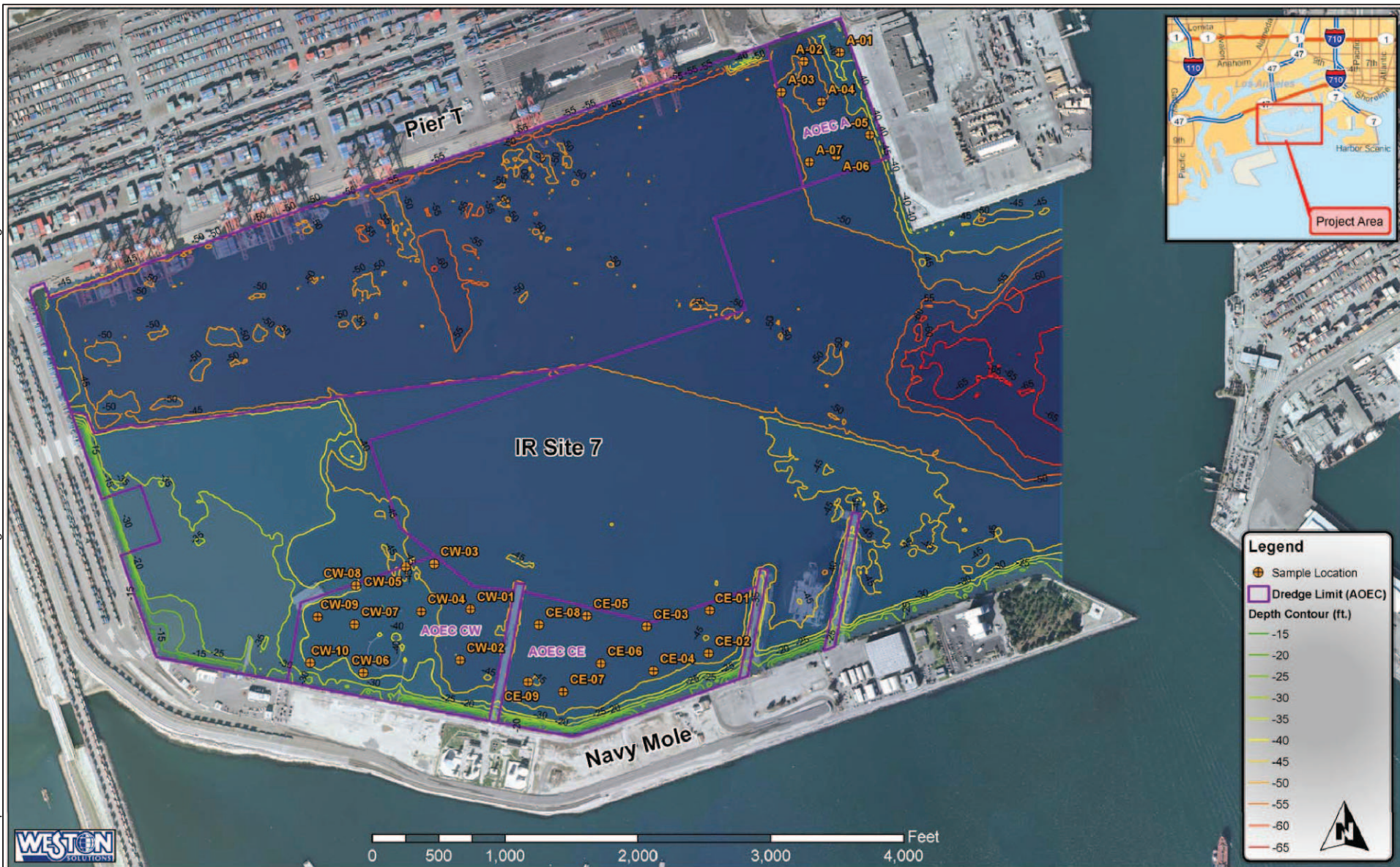
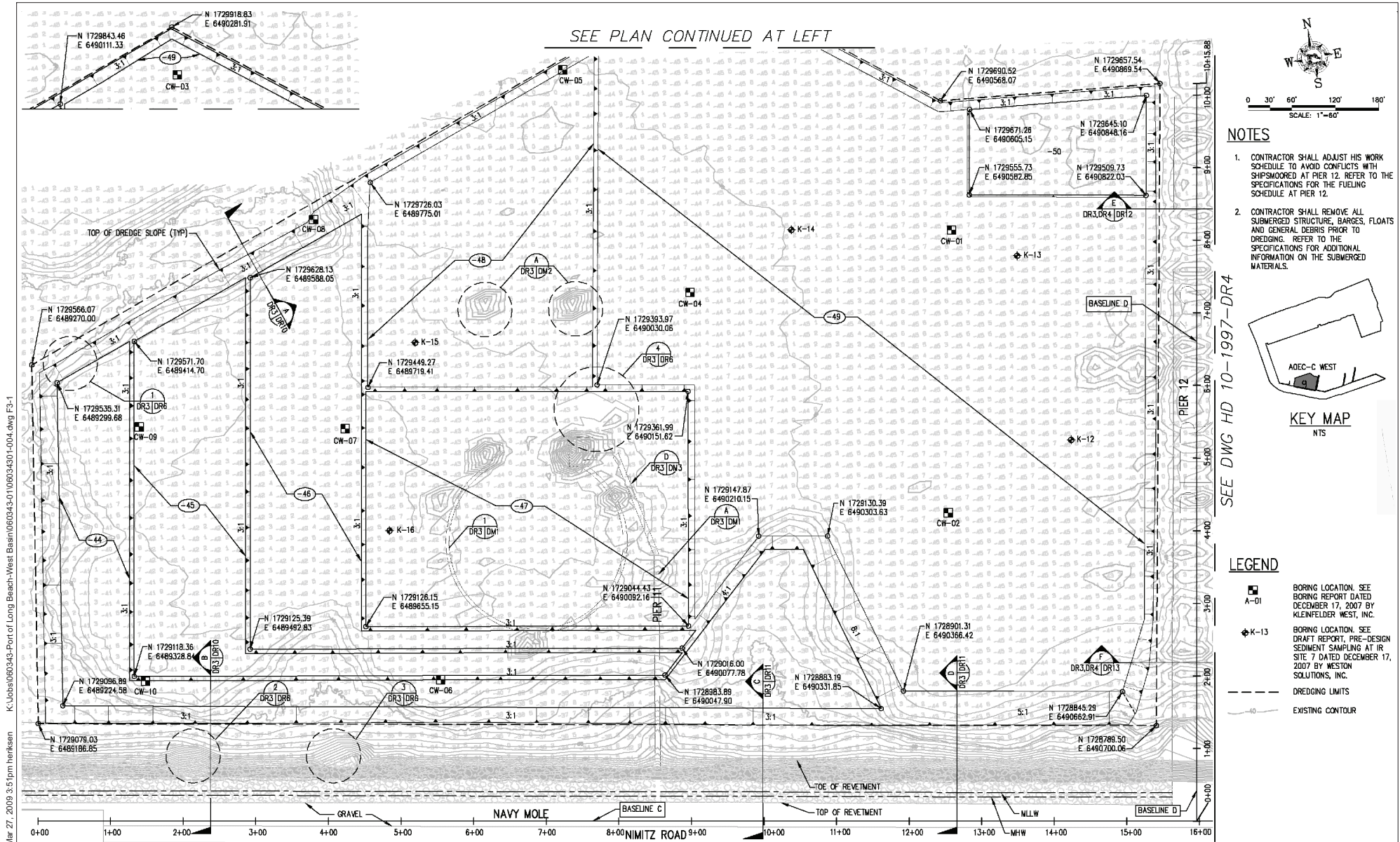
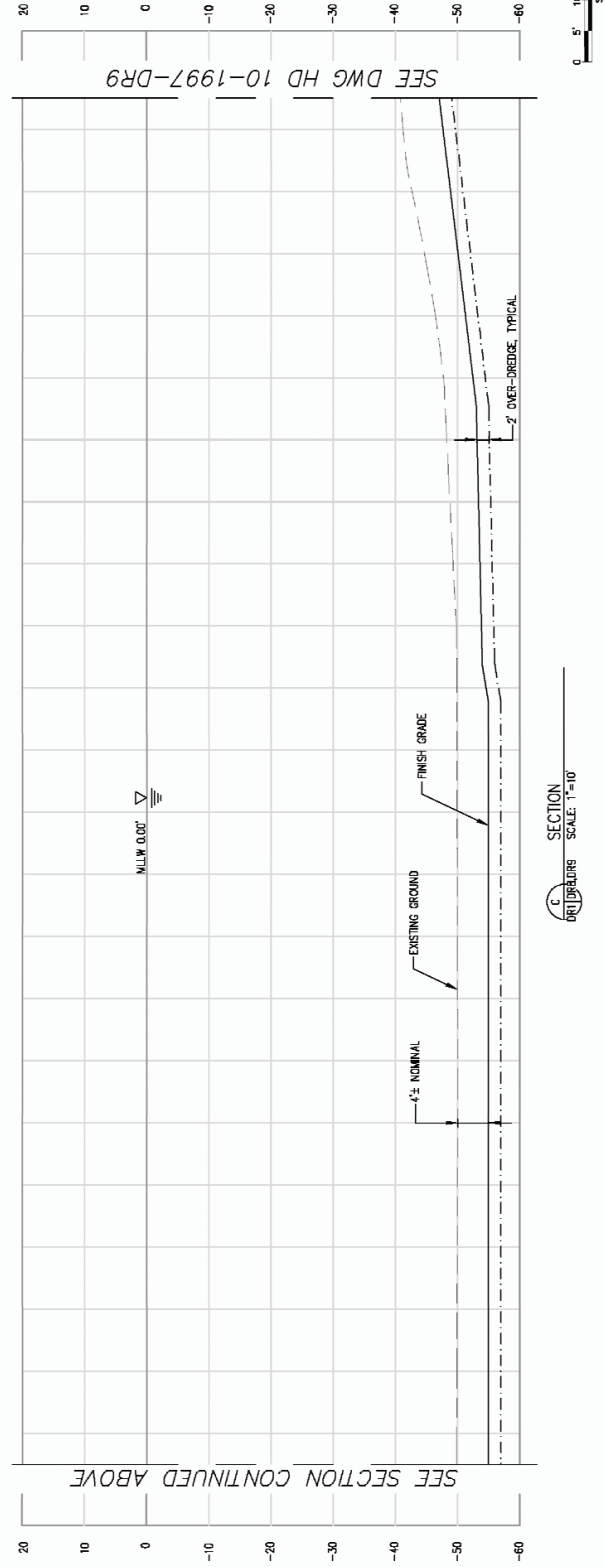
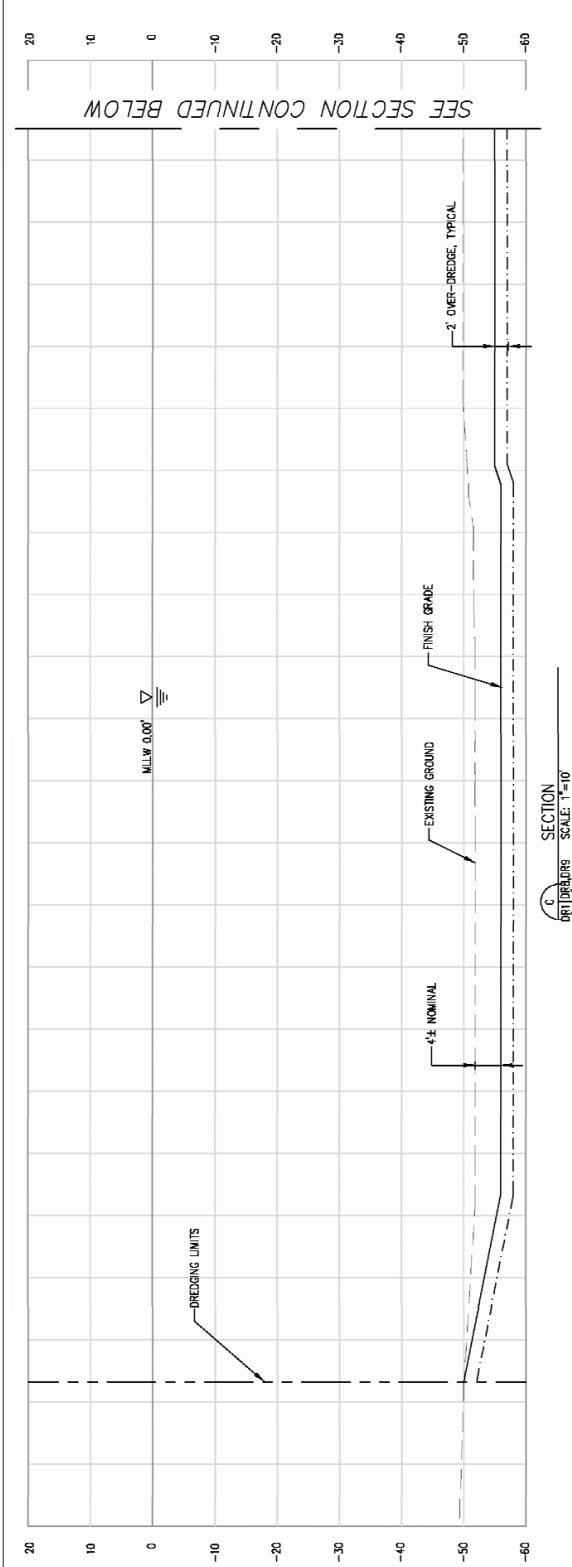


Figure 1-2
Project Location and Overall Site Plan
Remedial Design and Remedial Action Work Plan
IR Site 7 (West Basin)
Port of Long Beach, CA



Source: Drawing prepared from electronic file by Weston Solutions, Inc.

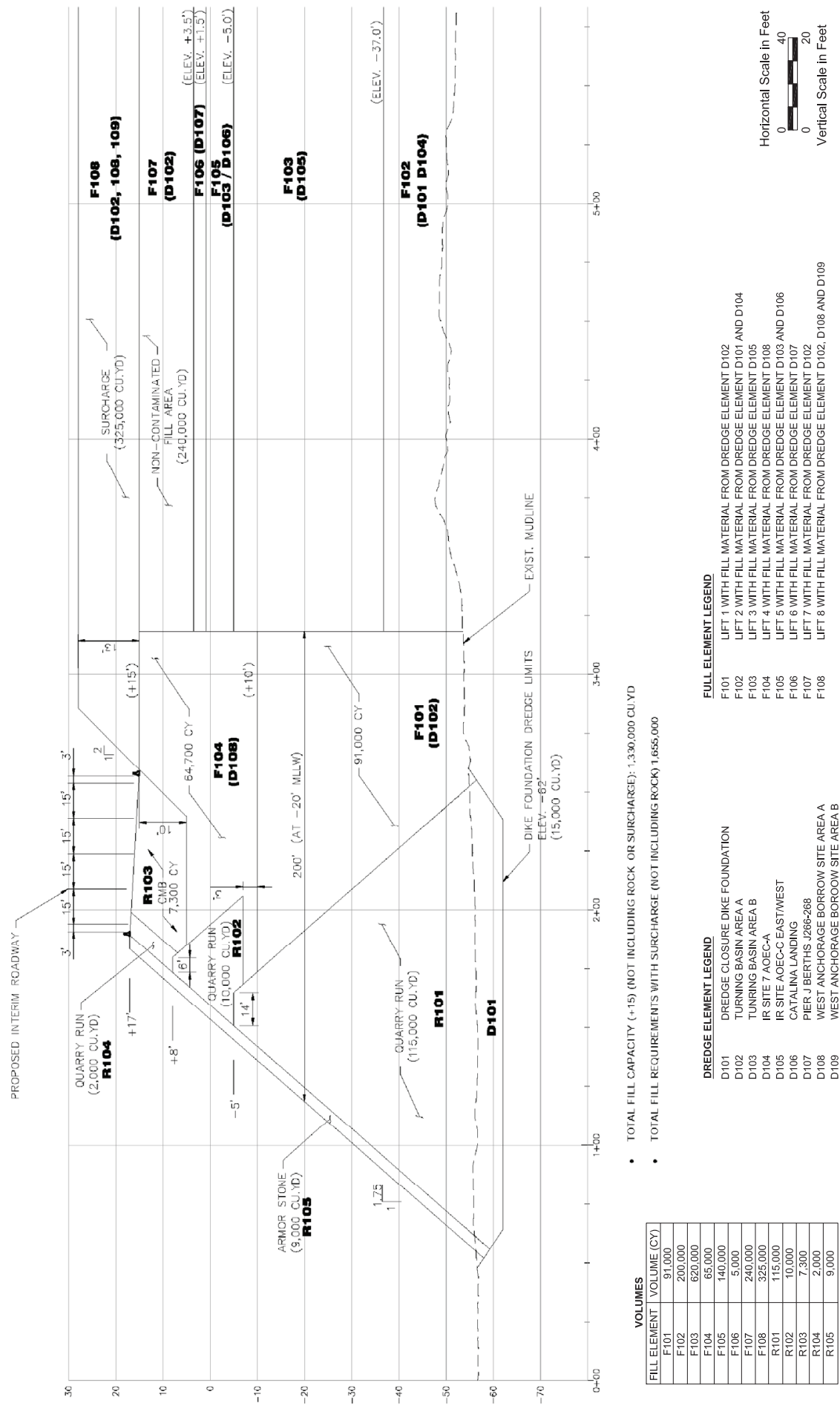




Note: Drawing prepared from electronic file by KPFF Consulting Engineers.



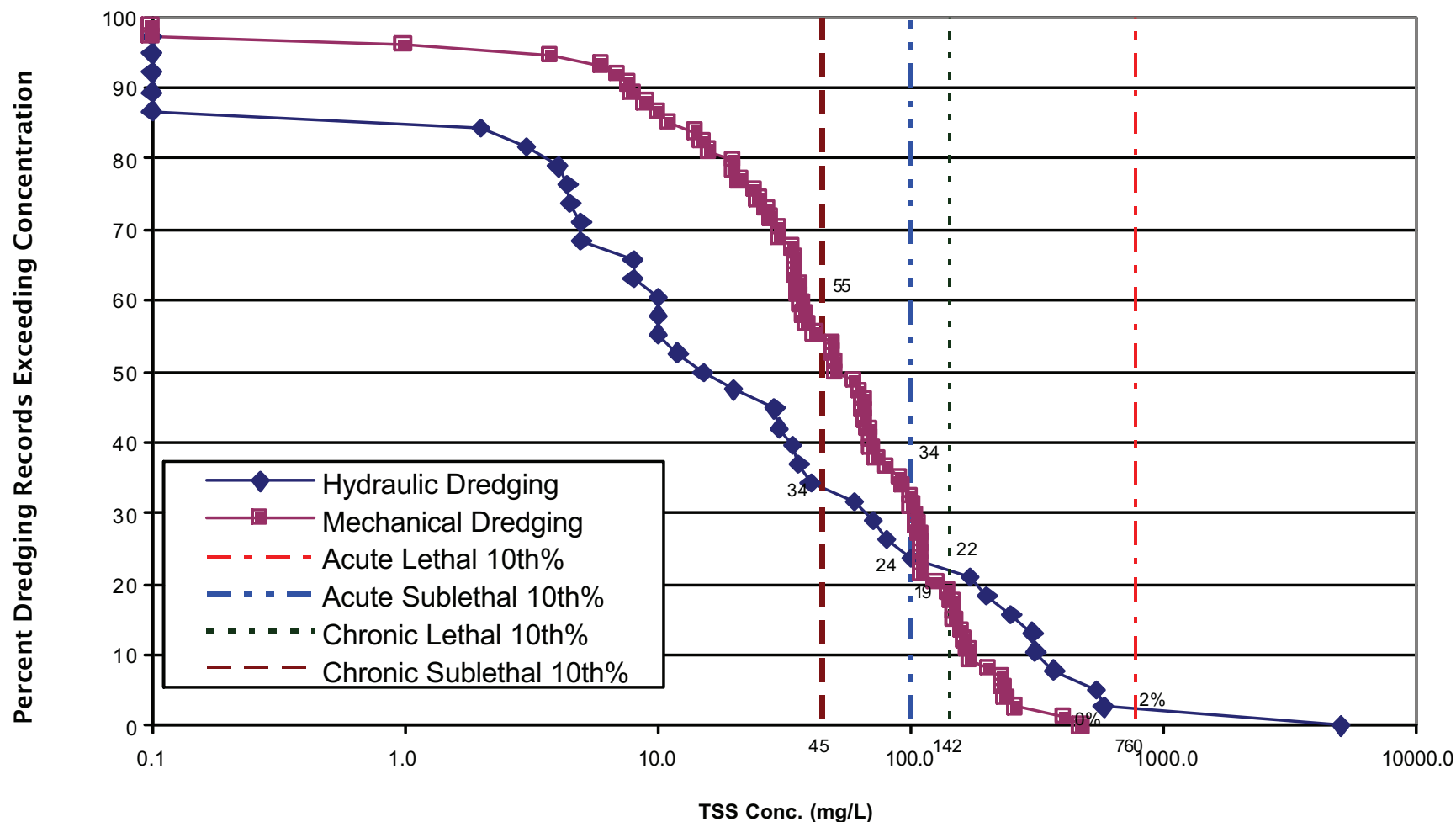
Figure 3-2
Section - Typical Dredge Cross Section for AOEC-A
Remedial Design and Remedial Action Work Plan
IR Site 7 (West Basin)
Port of Long Beach, CA



Note: Drawing prepared from pdf provided by Moffatt & Nichol dated 2/04/09.

Figure 3-3
Section - North Slip Fill Closure Dike
Remedial Design and Remedial Action Work Plan
IR Site 7 (West Basin)
Port of Long Beach, CA





Source: Anchor Environmental CA, L.P. 2003. Literature Review of Effects of Resuspended Sediments Due to Dredging Operations. Prepared for the Los Angeles Contaminated Sediments Task Force. Los Angeles, California. June 2003.

* Reported for various dredging operations to potential effects levels reported for a variety of marine and estuarine species.

Figure 5-1

Comparison of Total Suspended Sediment Data
Remedial Design and Remedial Action Work Plan
IR Site 7 (West Basin)
Port of Long Beach, CA

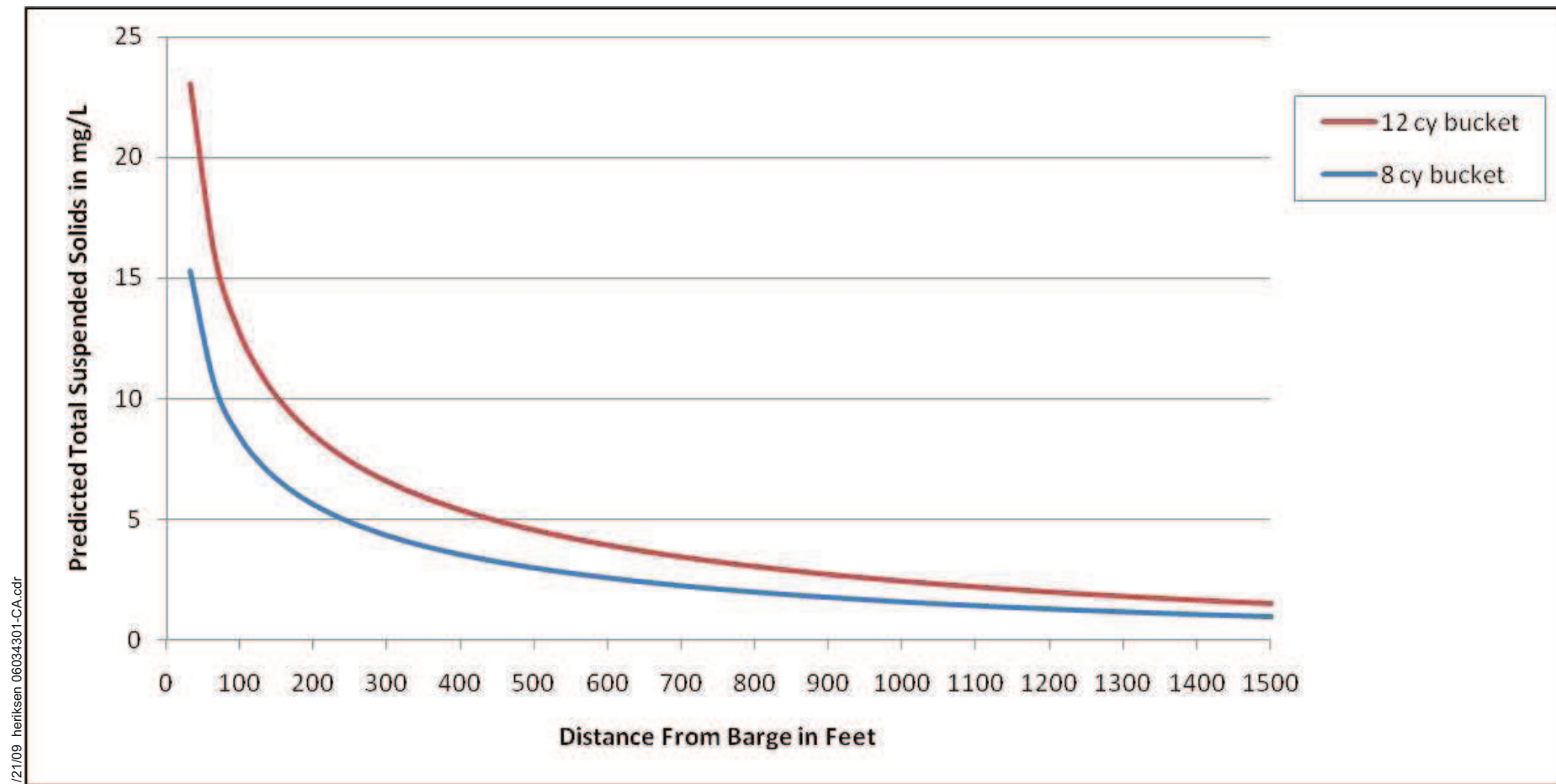


Figure 5-2
AOEC-A at 48 Feet Depth
Total Suspended Solids as Predicted by DREDGE
Remedial Design and Remedial Action Work Plan
IR Site 7 (West Basin)
Port of Long Beach, CA

1/21/09 heriksen 06034301-CA.cdr

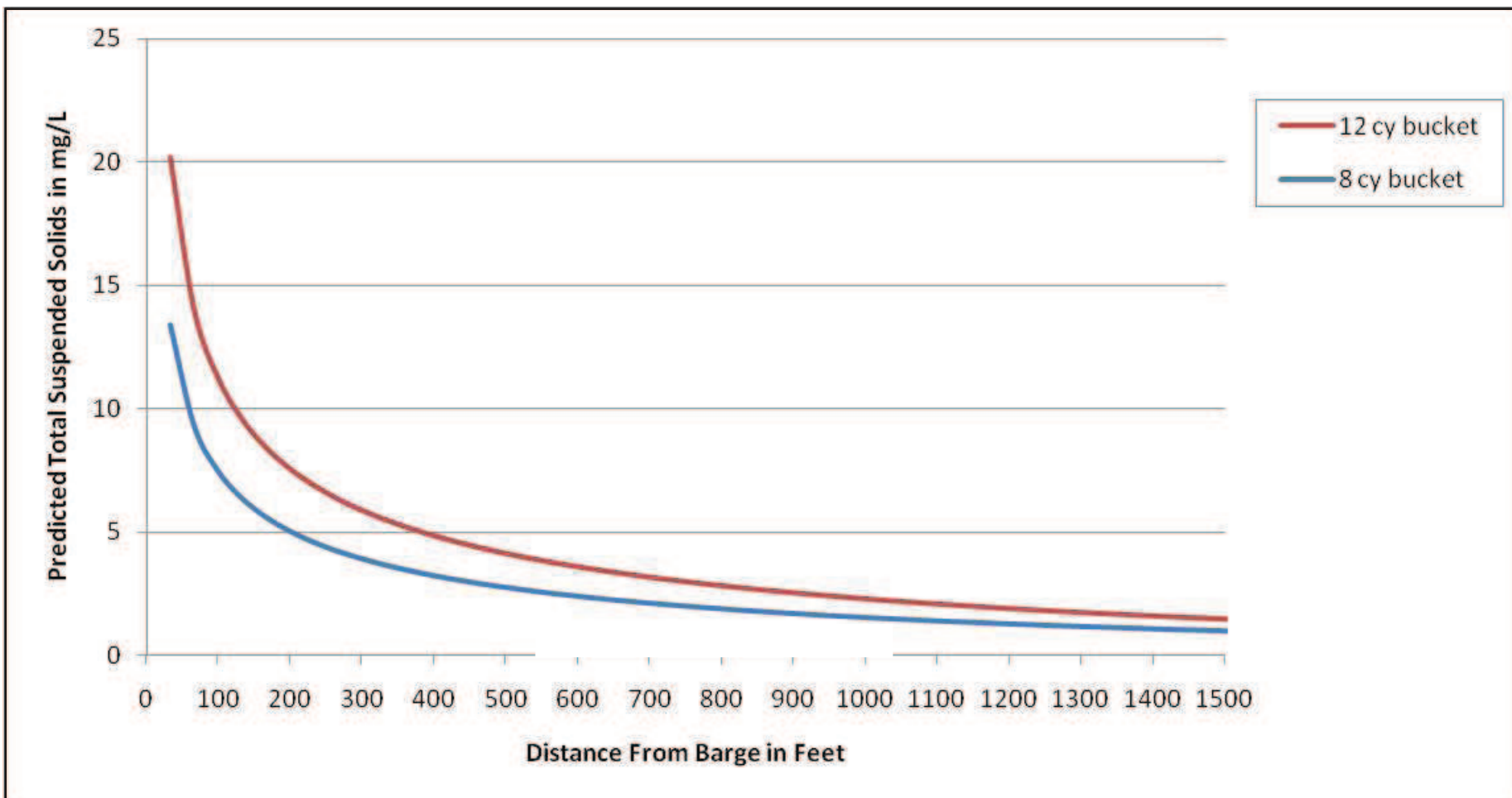


Figure 5-3
AOEC-A at 55 Feet Depth
Total Suspended Solids as Predicted by DREDGE
Remedial Design and Remedial Action Work Plan
IR Site 7 (West Basin)
Port of Long Beach, CA

1/21/09 heriksen 06034301-CA.cdr

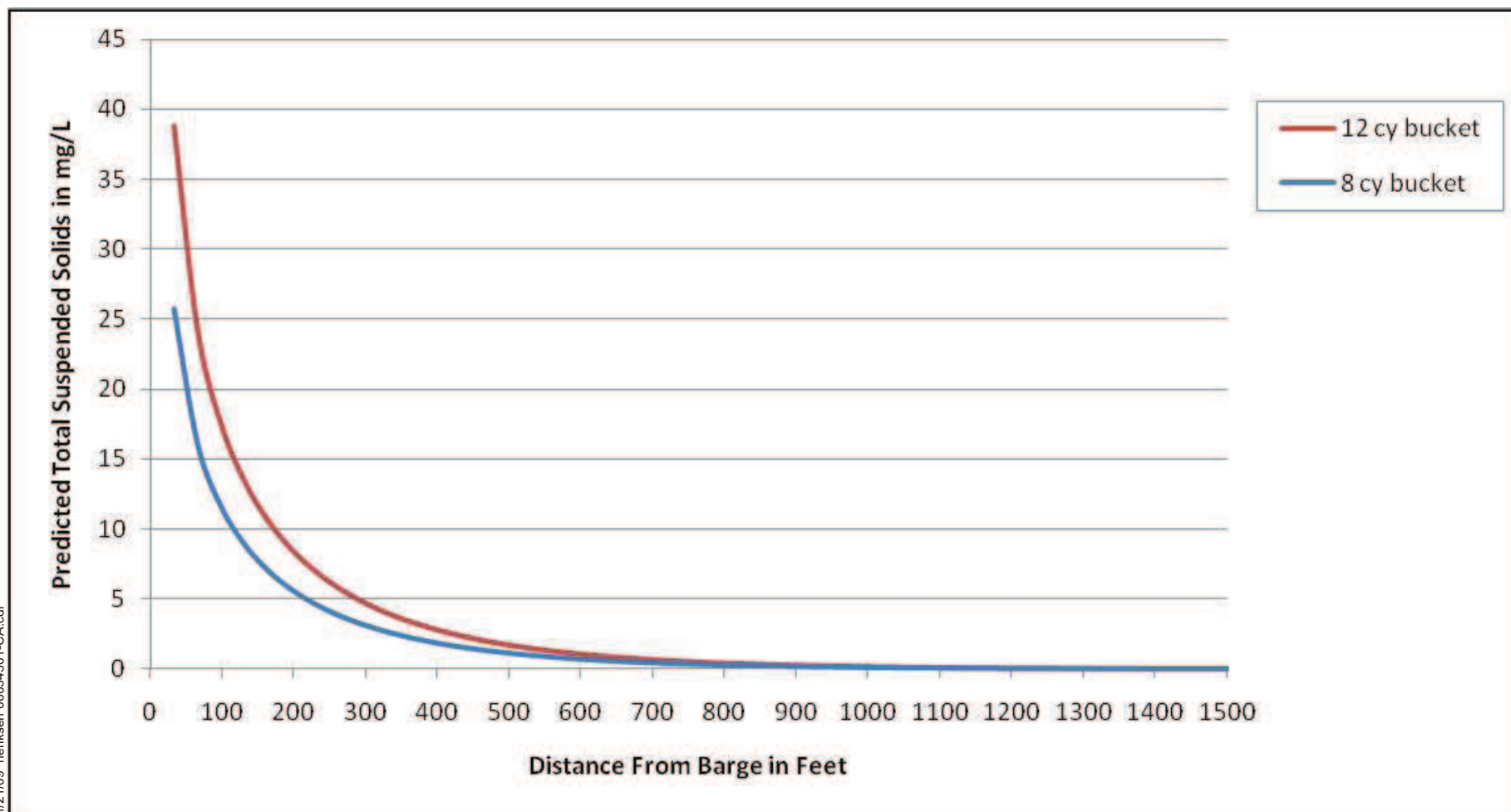


Figure 5-4
AOEC-C East at 45 Feet Depth
Total Suspended Solids as Predicted by DREDGE
Remedial Design and Remedial Action Work Plan
IR Site 7 (West Basin)
Port of Long Beach, CA

1/21/09 heriksen 06034301-CA.cdr

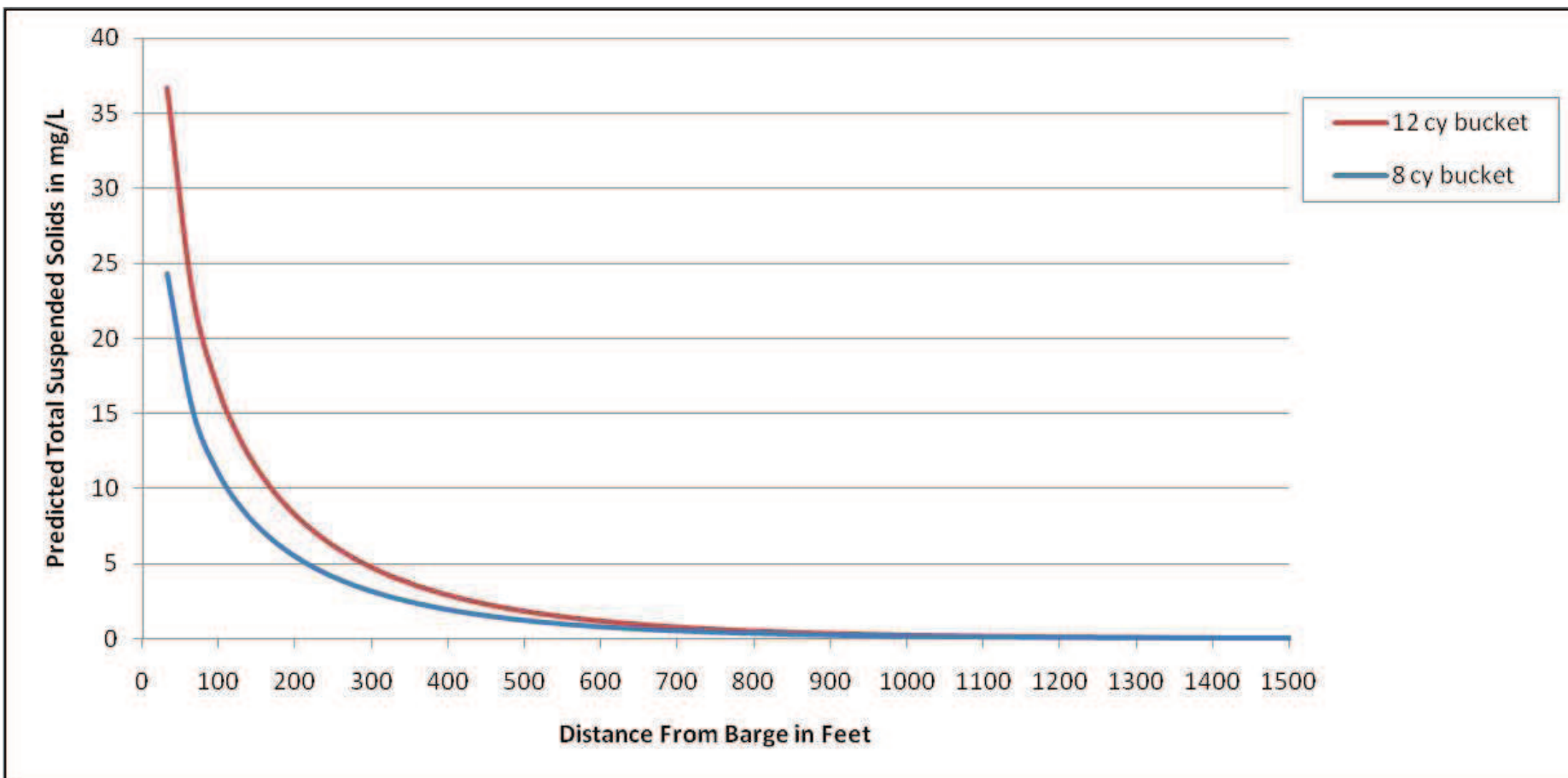


Figure 5-5
AOEC-C East at 48 Feet Depth
Total Suspended Solids as Predicted by DREDGE
Remedial Design and Remedial Action Work Plan
IR Site 7 (West Basin)
Port of Long Beach, CA

1/21/09 heriksen 06034301-CA.cdr

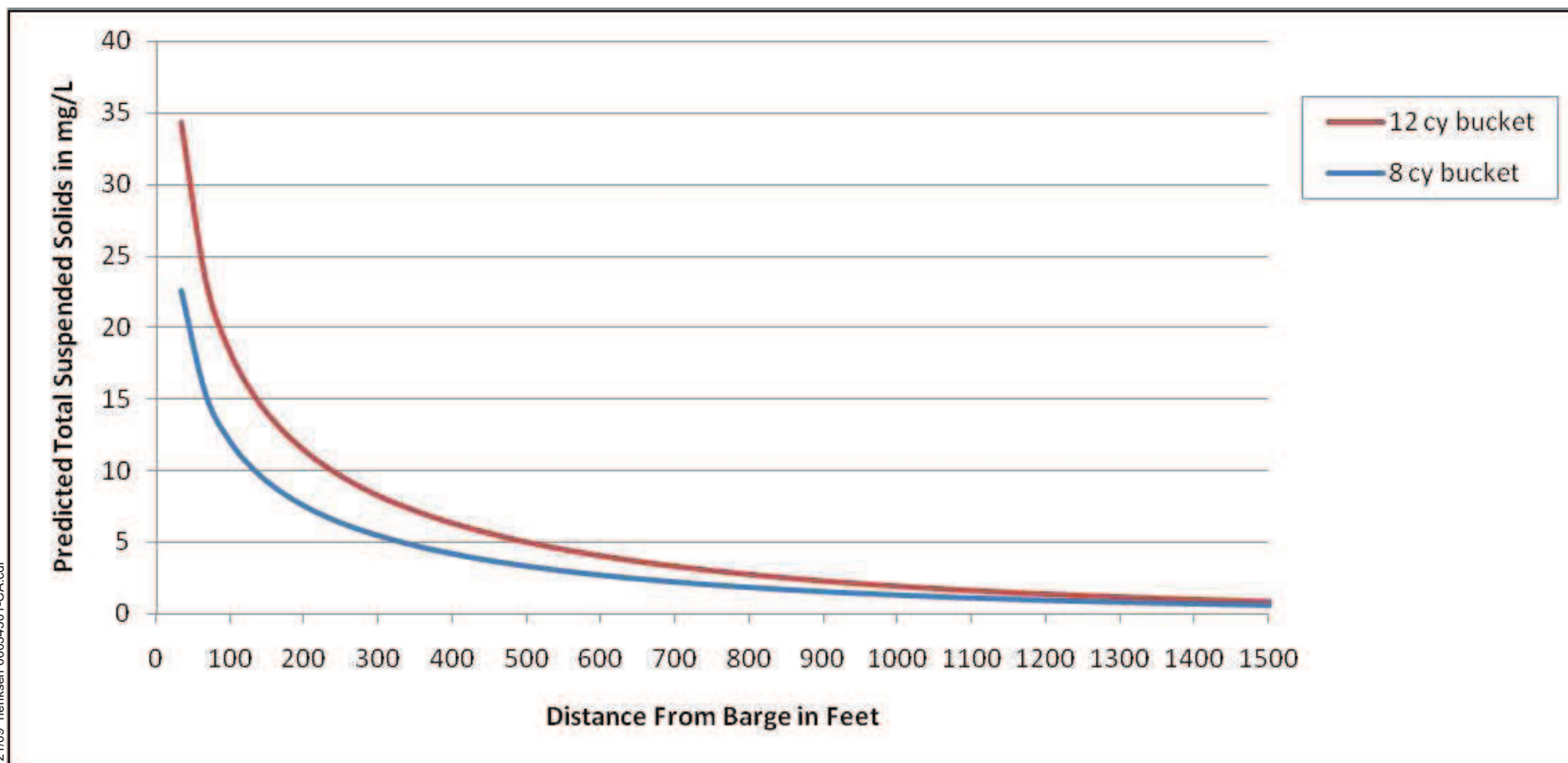


Figure 5-6
AOEC-C West at 35 Feet Depth
Total Suspended Solids as Predicted by DREDGE
Remedial Design and Remedial Action Work Plan
IR Site 7 (West Basin)
Port of Long Beach, CA

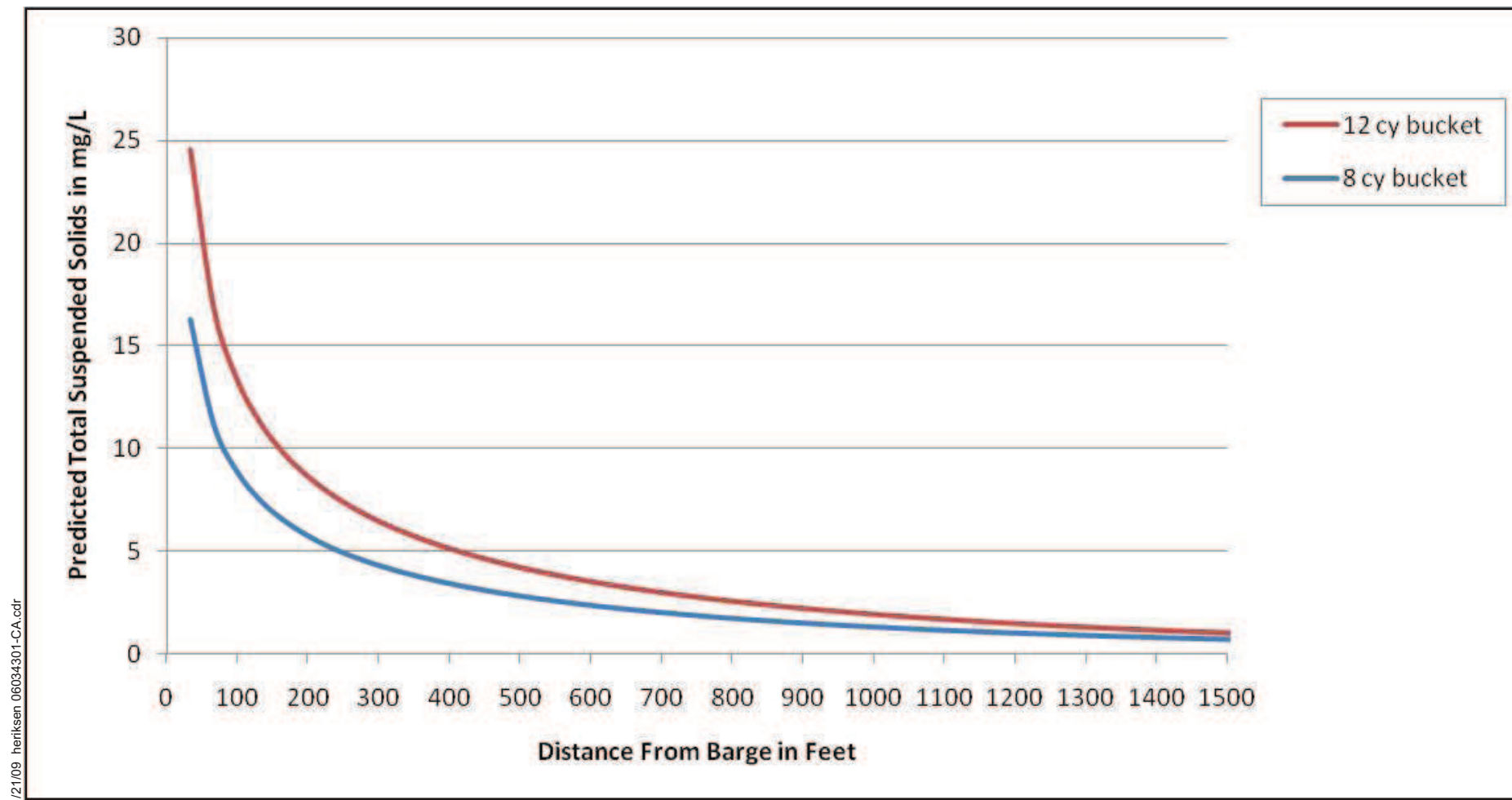
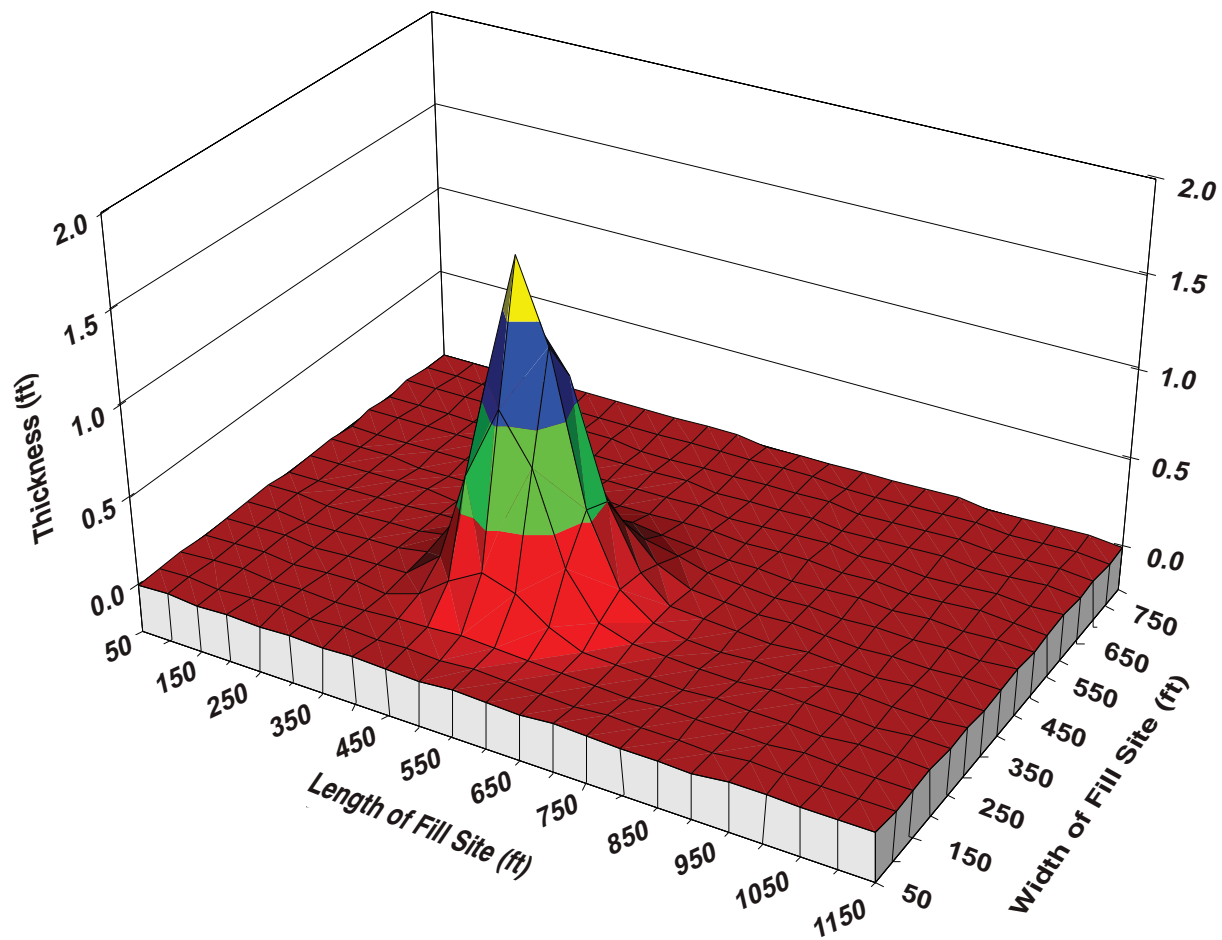
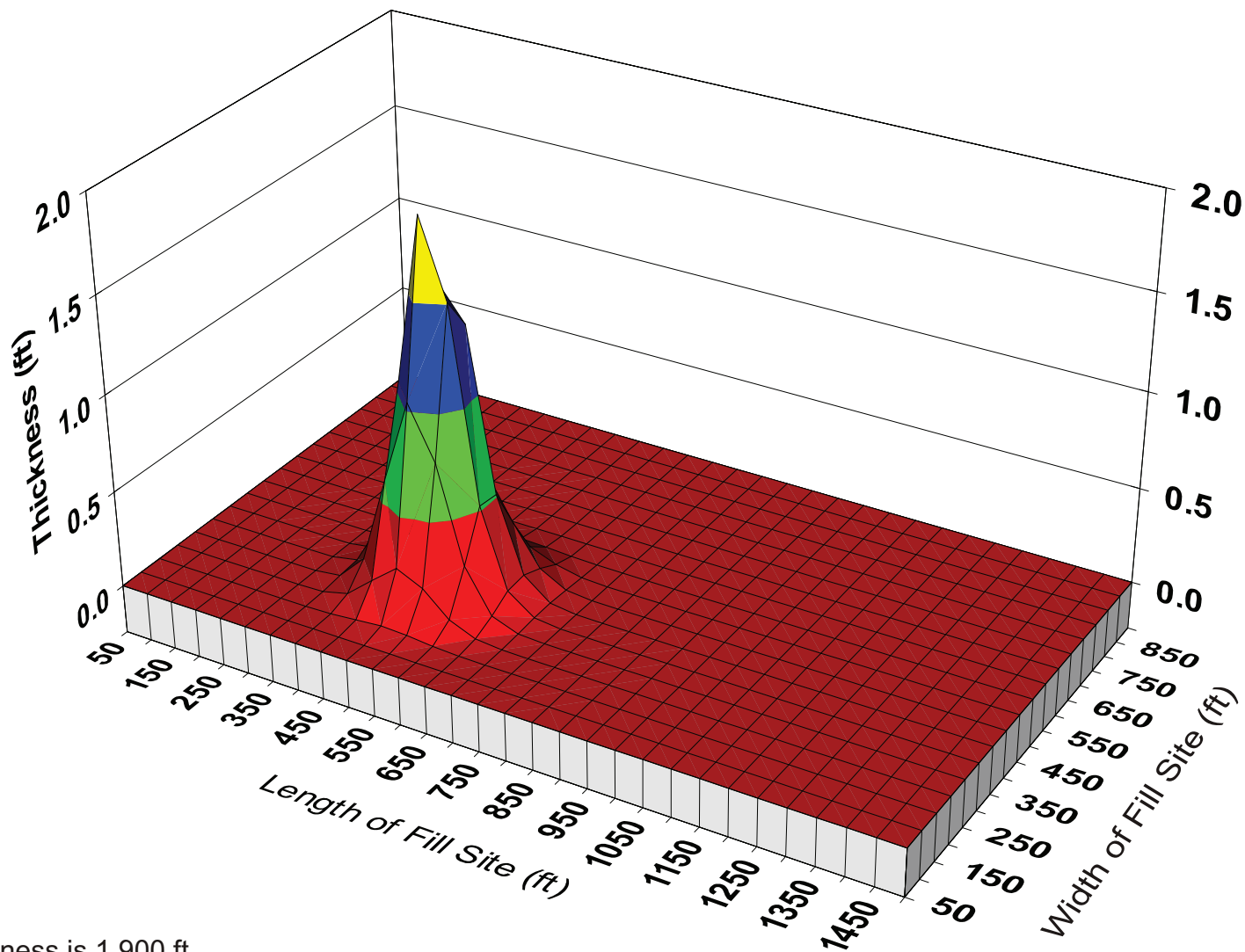


Figure 5-7
AOEC-C West at 49 Feet Depth
Total Suspended Solids as Predicted by DREDGE
Remedial Design and Remedial Action Work Plan
IR Site 7 (West Basin)
Port of Long Beach, CA



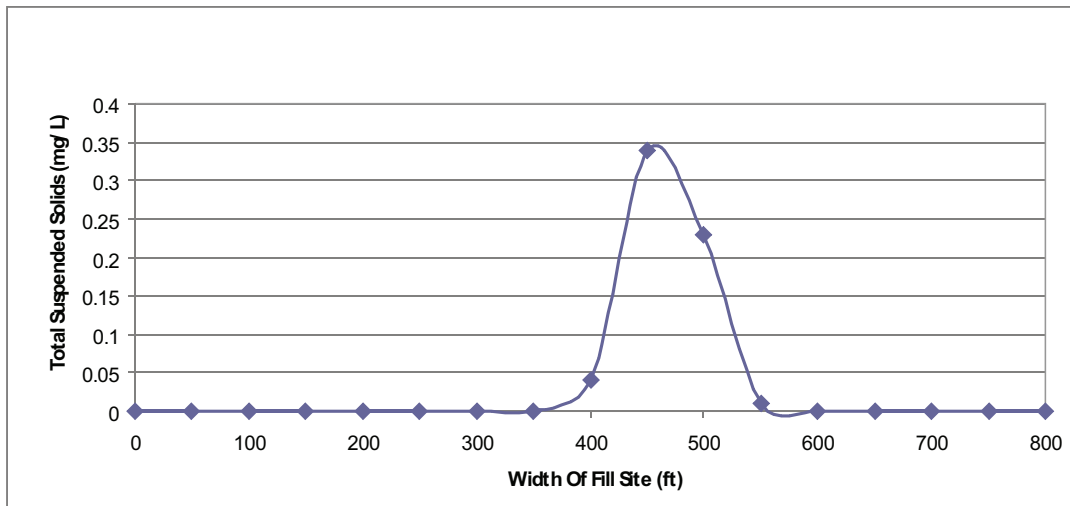
Max Thickness is 1.810 ft

Figure 5-8
 Total Deposited Material Thickness as a Function of
 Distance from Dump Location for AOEC-A
 Remedial Design and Remedial Action Work Plan
 IR Site 7 (West Basin)
 Port of Long Beach, CA

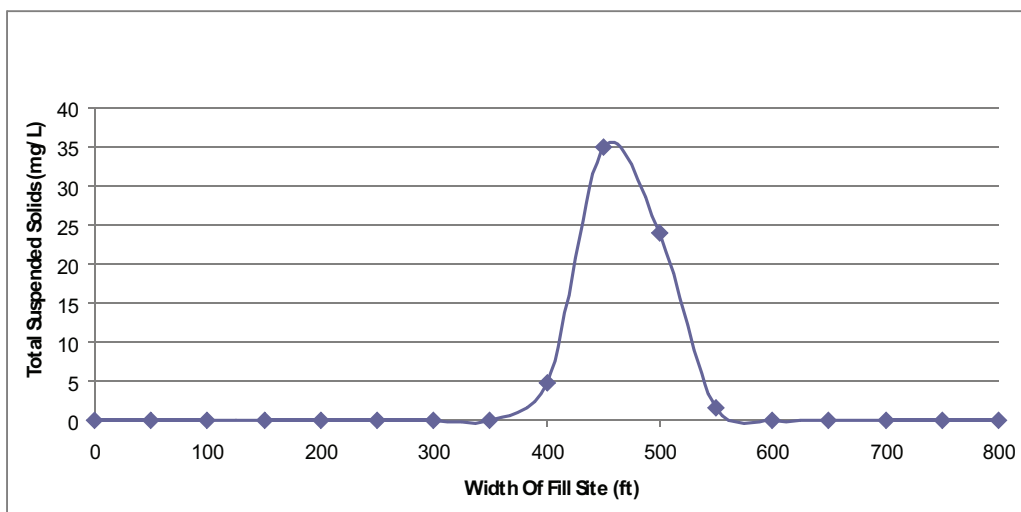


Max Thickness is 1.900 ft

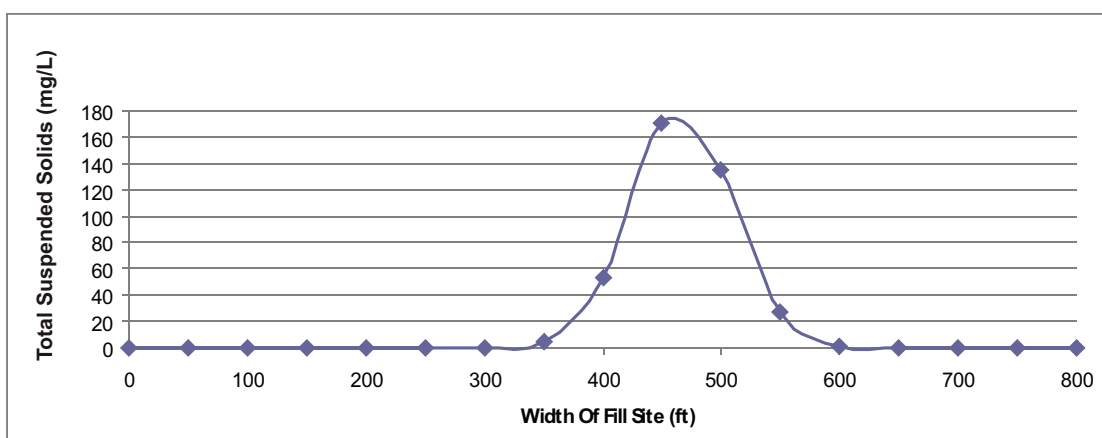
Figure 5-9
 Total Deposited Material Thickness as a Function of
 Distance from Dump Location for AOEC-C West
 Remedial Design and Remedial Action Work Plan
 IR Site 7 (West Basin)
 Port of Long Beach, CA



A. At 7 Feet Below Water Depth

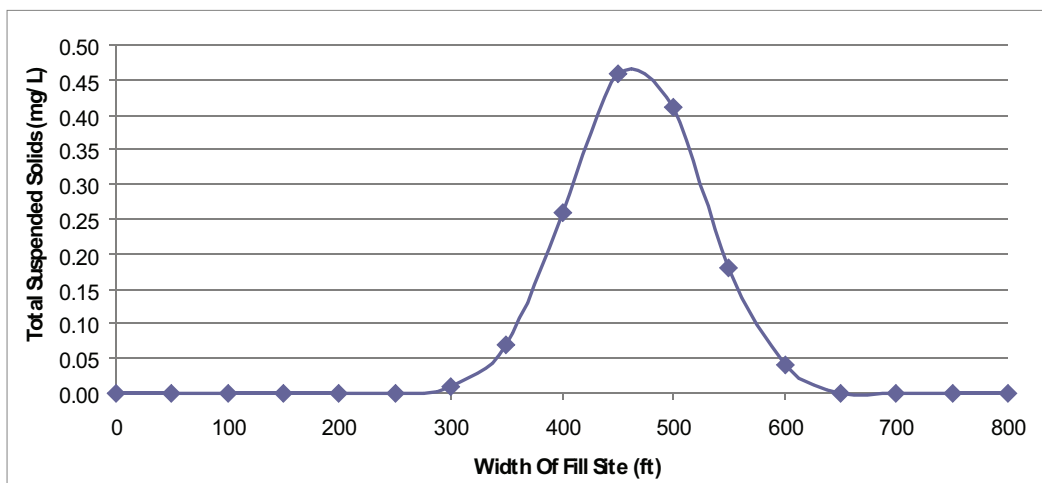


B. At 24 Feet Below Water Depth

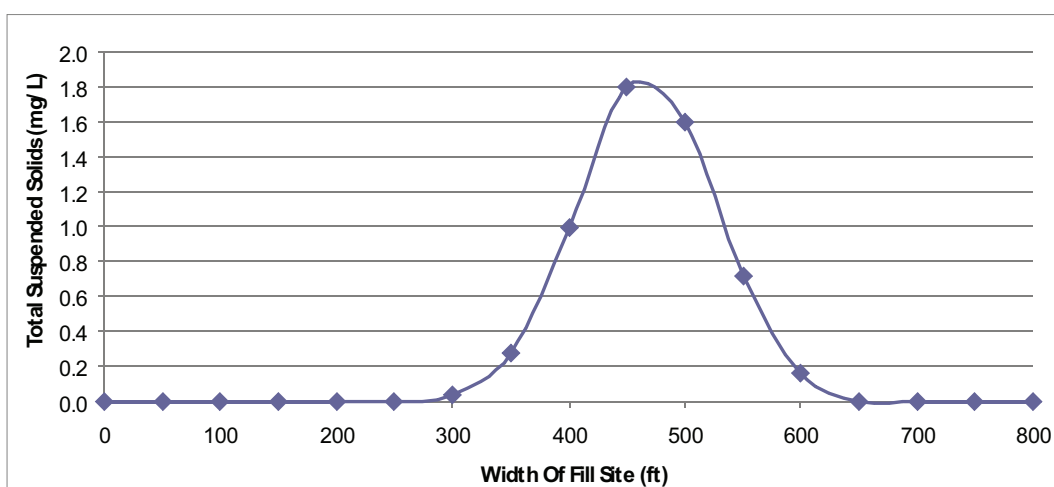


C. At 48 Feet Below Water Depth

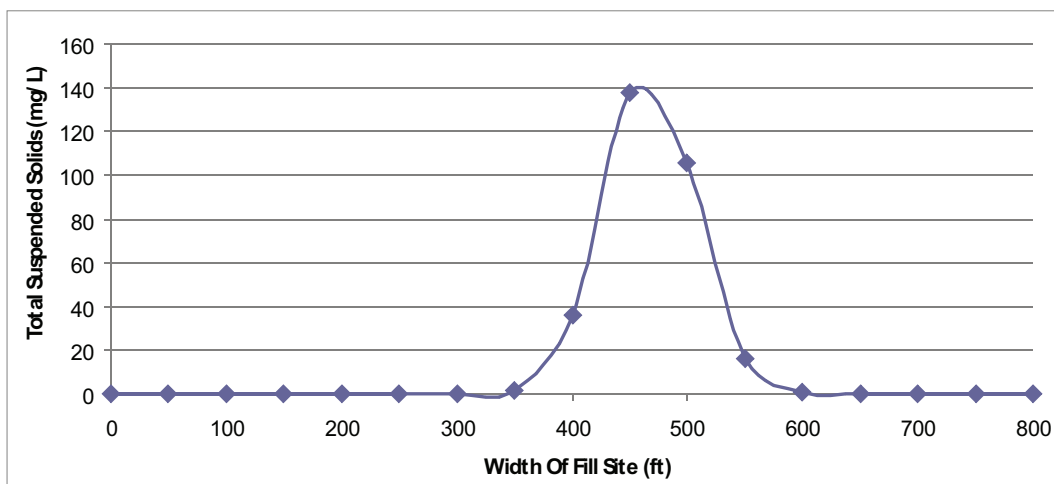
Figure 5-10
Concentration of Total Suspended Solids as a Function of
Distance from Dump Location for AOEC-A
Remedial Design and Remedial Action Work Plan
IR Site 7 (West Basin)
Port of Long Beach, CA



A. At 1 Foot Below Water Depth



B. At 15 Feet Below Water Depth



C. At 30 Feet Below Water Depth

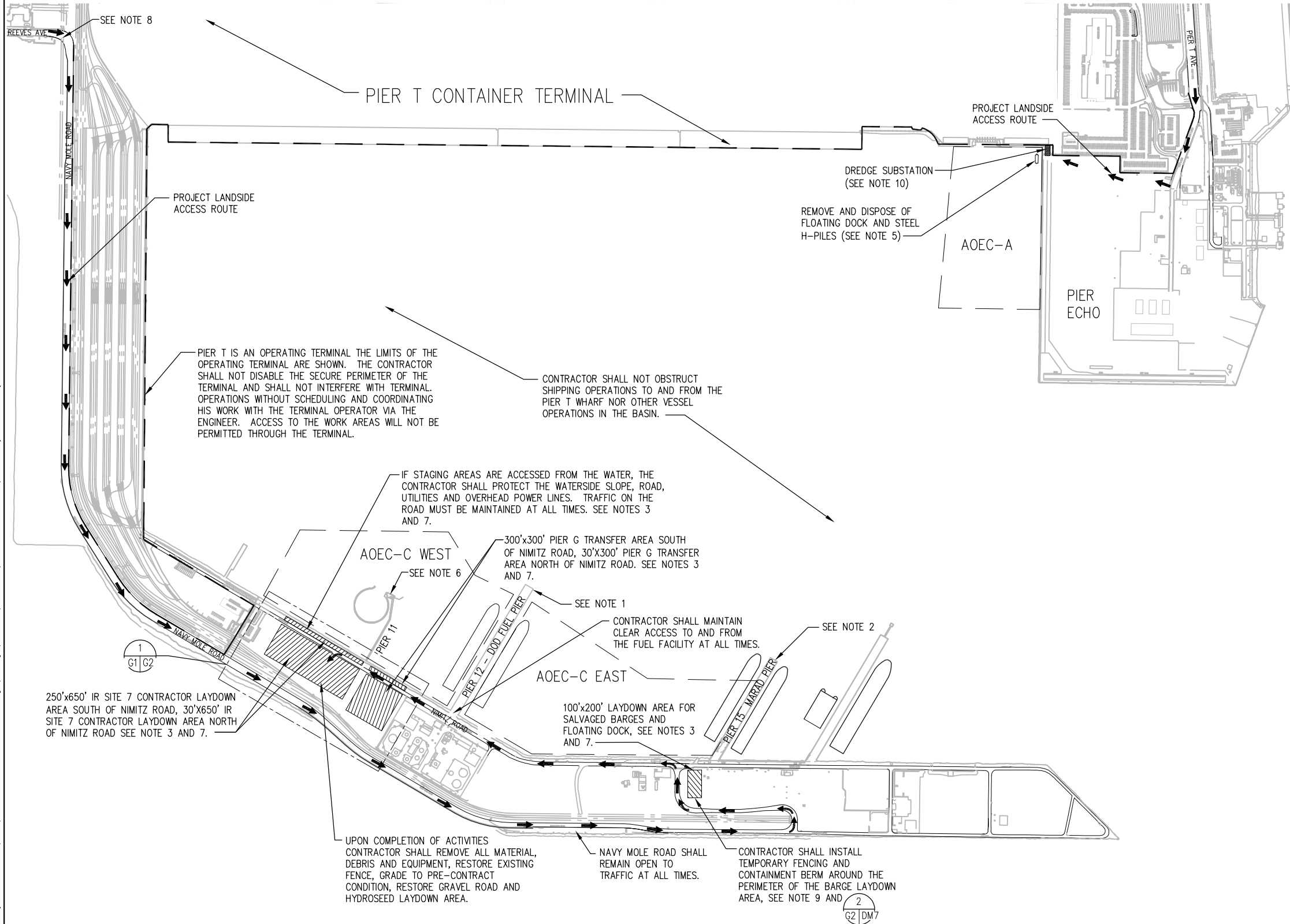
Figure 5-11
Concentration of Total Suspended Solids as a Function of
Distance from Dump Location for AOEC-C West
Remedial Action Plan and Design Report
IR Site 7 (West Basin)
Port of Long Beach, CA

APPENDIX A

**DRAFT CONSTRUCTION PLANS FOR DREDGING OF WEST BASIN
(PROVIDED ON CD)**

PREPARED BY KPFF CONSULTING ENGINEERS

Plotted: Mar 16, 2009 - 4:06pm jhollenbach M:\2007\107224 - POLB- West Basin Dredge Drawings\CURRENT\01997-G1 (LAYDOWN & SEQUENCE).DWG Layout Name: Layout1



SEQUENCE OF DREDGING:

CONTRACTOR SHALL DREDGE AOEC AREAS IN THE FOLLOWING ORDER:

1. DREDGE AREA AOEC-A
2. DREDGE AREA AOEC-C WEST
3. DREDGE AREA AOEC-C EAST

NOTES:

1. CONTRACTOR SHALL COORDINATE ALL WORK AROUND PIER 12 "DOD FUEL PIER" VIA THE CONTRACTING OFFICER..
2. CONTRACTOR SHALL COORDINATE ALL WORK AROUND PIER 15 "MARAD PIER" VIA THE CONTRACTING OFFICER.
3. CONTRACTOR SHALL NOT BLOCK NIMITZ ROAD OR NAVY MOLE ROAD.
4. PRIOR TO THE START OF DREDGING IN AN AREA AS SEQUENCED ABOVE, THE CONTRACTOR SHALL REMOVE SUBMERGED BARGES AND ALL "KNOWN LARGE DEBRIS" FROM THAT AREA.
5. CONTRACTOR SHALL REMOVE FLOATING DOCK FROM AREA AOEC-A PRIOR TO THE START OF DREDGING IN AOEC-A.
6. CONTRACTOR SHALL DEMOLISH PIER 11 PRIOR TO THE START OF DREDGING IN AOEC-C WEST.
7. CONTRACTOR SHALL FIELD VERIFY AND PROTECT IN PLACE ALL SURFACE FEATURES AND EXISTING SUBSURFACE UTILITIES (SEWER FORCE MAIN, WATER LINES, FUEL LINES AND VENTS, GAS LINE, CATCH BASIN, ETC) AND OTHER IMPROVEMENTS WITHIN ALL LAYDOWN/TRANSFER AREAS AND SURROUNDING AREAS, UNLESS NOTED OTHERWISE.
8. THE INTERSECTION AT REEVES AVE. AND NAVY MOLE ROAD INCLUDES AN AT-GRADE RAILROAD CROSSING. CONTRACTOR SHALL ANTICIPATE THAT THERE WILL BE DELAYS AT THE INTERSECTION DUE TO RAIL TRAFFIC THROUGH THE INTERSECTION.
9. TEMPORARY FENCING SHALL BE CONSTRUCTED PER PORT OF LONG BEACH STANDARD PLANS.
10. CONTRACTOR SHALL PROVIDE ALL TEMPORARY DREDGE POWER, CABLE ANCHORING, CABLE PROTECTION, SAFETY EQUIPMENT AND LIGHTING THAT CONTRACTOR DEEMS NECESSARY FOR USE OF SUBSTATION. SUBSTATION AND SURROUNDING FACILITIES SHALL BE RESTORED TO ORIGINAL CONDITION WHEN WORK IS COMPLETE UNLESS DIRECTED OTHERWISE BY THE CONTRACTING OFFICER.

LEGEND

- AOEC LIMITS
- LIMITS OF OPERATING TERMINAL
- → PROJECT ACCESS ROUTE
- ▨ LANDSIDE LAYDOWN AREAS

FN: D1997GL

kpff Consulting Engineers
400 Oceangate, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

MARK	DATE	BY	REVISIONS

DRAWN J.H. DATE 3/2009
DESIGNED D.B. P.E. NO.
PROJ. MGR. C.A. P.E. NO. C-44141
SECT. HEAD D.J.S. P.E. NO. C-46837

CHIEF HARBOR ENGINEER P.E. NO. C-25677 DATE



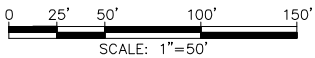
THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
SEQUENCING PLAN

SCALE
AS SHOWN SHEET 3 OF 28
SPECIFICATION NUMBER HD-S2319
DRAWING NUMBER HD 10-1997-G1

FINAL SUBMITTAL SET



1. THE EXISTENCE, LOCATION AND CHARACTERISTICS OF EXISTING ABOVE AND BELOW GROUND UTILITIES SHOWN ON THIS PLAN WAS OBTAINED FROM A REVIEW OF AVAILABLE RECORD DATA. NO REPRESENTATION IS MADE AS TO THE TOTAL ACCURACY OR COMPLETENESS OF SAID EXISTING UTILITY INFORMATION.
2. CONTRACTOR SHALL NOT BLOCK NIMITZ ROAD OR NAVY MOLE ROAD.
3. CONTRACTOR SHALL FIELD VERIFY AND PROTECT IN PLACE ALL SURFACE FEATURES AND EXISTING SUBSURFACE UTILITIES (SEWER FORCE MAIN, WATER LINES, FUEL LINES AND VENTS, GAS LINE, CATCH BASIN, ETC) AND OTHER IMPROVEMENTS WITHIN ALL LAYDOWN/TRANSFER AREAS AND SURROUNDING AREAS, UNLESS NOTED OTHERWISE.
4. CONTRACTOR SHALL NOT ENTER THE LONGSHORE PARKING AREA, ALL CONTRACTOR PARKING SHALL BE WITHIN THE CONTRACTOR LAYDOWN AREA, PER DIRECTION OF CONTRACTING OFFICER.
5. UPON COMPLETION OF THIS CONTRACT THE CONTRACTOR SHALL REPLACE ALL FENCING ALONG NIMITZ THAT WAS REMOVED TO PROVIDE ACCESS TO THE LAYDOWN AREAS.
6. CONTRACTOR SHALL STOCKPILE AND STAGE ALL EQUIPMENT, SUPPLIES AND MATERIALS WITHIN THE LAYDOWN/TRANSFER AREAS LIMITS UNLESS NOTED OTHERWISE. WHEN CONTRACT WORK IS COMPLETE CONTRACTOR SHALL CLEAR, CLEAN AND RESTORE THE LAYDOWN/TRANSFER AREAS.

LIMITS OF LAYDOWN/TRANSFER AREAS

MOLE LAYDOWN AREAS PLAN
SCALE: 1"=50'

THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
MOLE LAYDOWN AND TRANSFER PLAN

FN: D1997G1

kpff Consulting Engineers

400 Oceagate, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

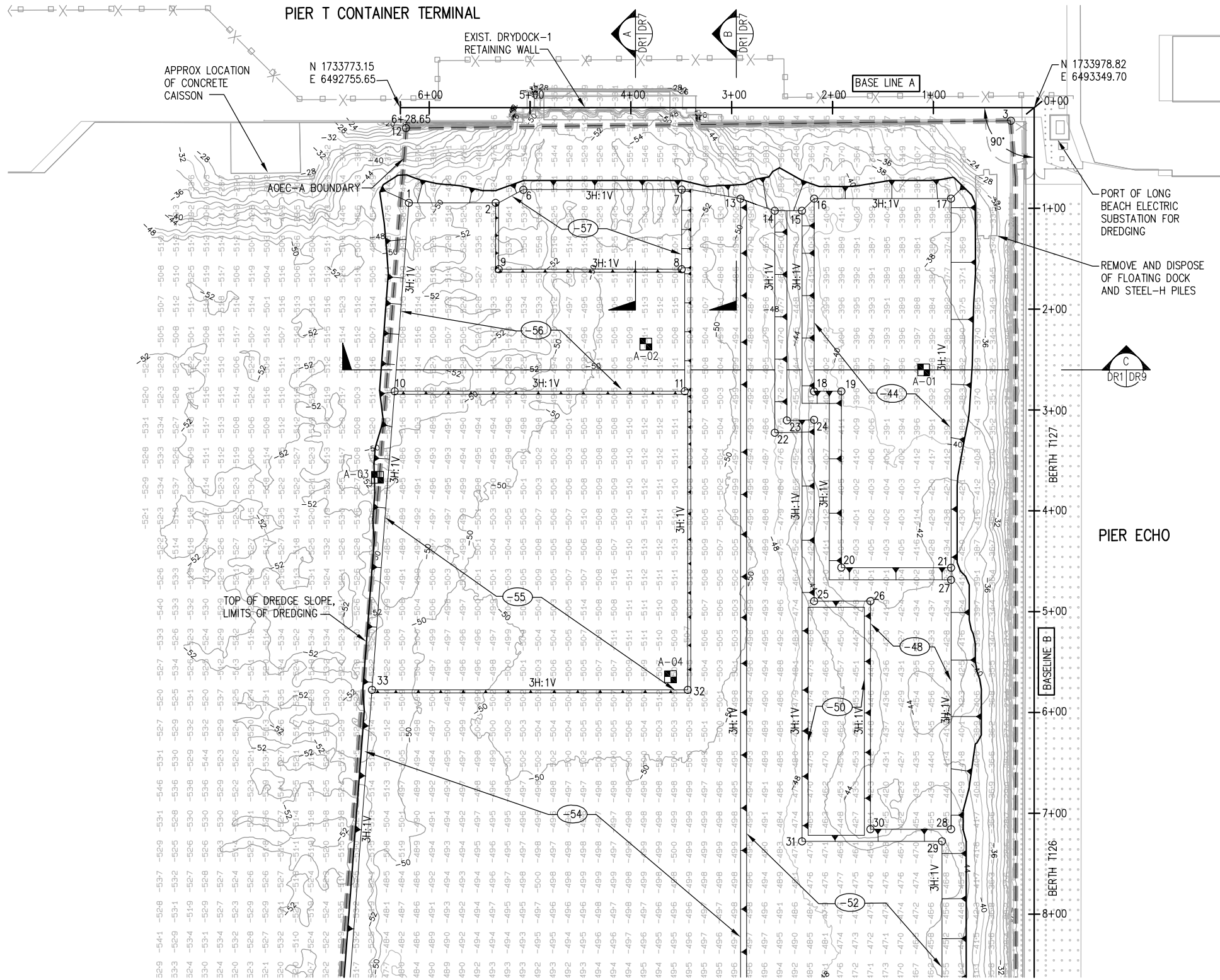
SCALE
AS SHOWN SHEET 4 OF 28

SPECIFICATION
NUMBER HD-S2319

DRAWING
NUMBER HD 10-1997-G2

FN: D1997G1

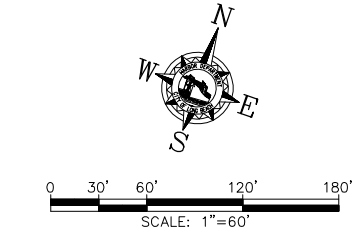
FINAL SUBMITTAL SET



SEE DWG HD 10-1997-DR2

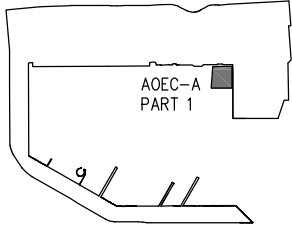
AOEC-A DREDGE CONTROL POINTS		
POINT	NORTHING	EASTING
1	1733687	6492795
2	1733715	6492876
3	1733959	6493332
4	1732909	6493701
5	1732683	6493049
6	1733736	6492898
7	1733788	6493046
8	1733713	6493072
9	1733654	6492900
10	1733506	6492842
11	1733600	6493114
12	1733756	6492768
13	1733798	6493104
14	1733798	6493140
15	1733807	6493165
16	1733822	6493173
17	1733867	6493301
18	1733642	6493235
19	1733651	6493261
20	1733485	6493318
21	1733521	6493421
22	1733590	6493212
23	1733606	6493219
24	1733615	6493245
25	1733445	6493303
26	1733463	6493356
27	1733509	6493425
28	1733276	6493506
29	1733262	6493501
30	1733250	6493430
31	1733216	6493370
32	1733321	6493214
33	1733219	6492918
34	1732703	6493054
35	1732838	6493443
36	1732901	6493626

NOTE: DREDGE CONTROL POINTS REFER TO EITHER THE TOP OR TOE OF DREDGE SLOPE AS SHOWN ON THE DRAWINGS.



NOTES

- ALL DREDGE SLOPES SHALL BE 3H:1V, UNLESS NOTED OTHERWISE.



KEY MAP
NTS

LEGEND

- BORING LOCATION. SEE BORING REPORT DATED DECEMBER 17, 2007 BY KLEINFELDER, INC.
- BORING LOCATION. SEE DRAFT REPORT, PRE-DESIGN SEDIMENT SAMPLING AT IR SITE 7 DATED DECEMBER 17, 2007 BY WESTON SOLUTIONS, INC.
- TOP OF DREDGE SLOPE, LIMITS OF DREDGING
- AOEC BOUNDARY
- EXISTING CONTOUR
- PROJECT DREDGE DEPTH (MLLW)
- DREDGE AREA CONTROL POINTS

FN: D1997DR1

kpff Consulting Engineers
400 Oceangate, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

SCALE
AS SHOWN SHEET 5 OF 28
SPECIFICATION NUMBER
HD-S2319
DRAWING NUMBER
HD 10-1997-DR1

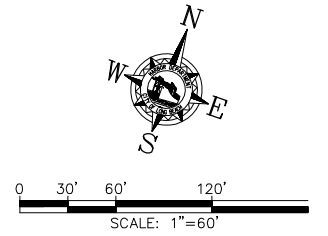
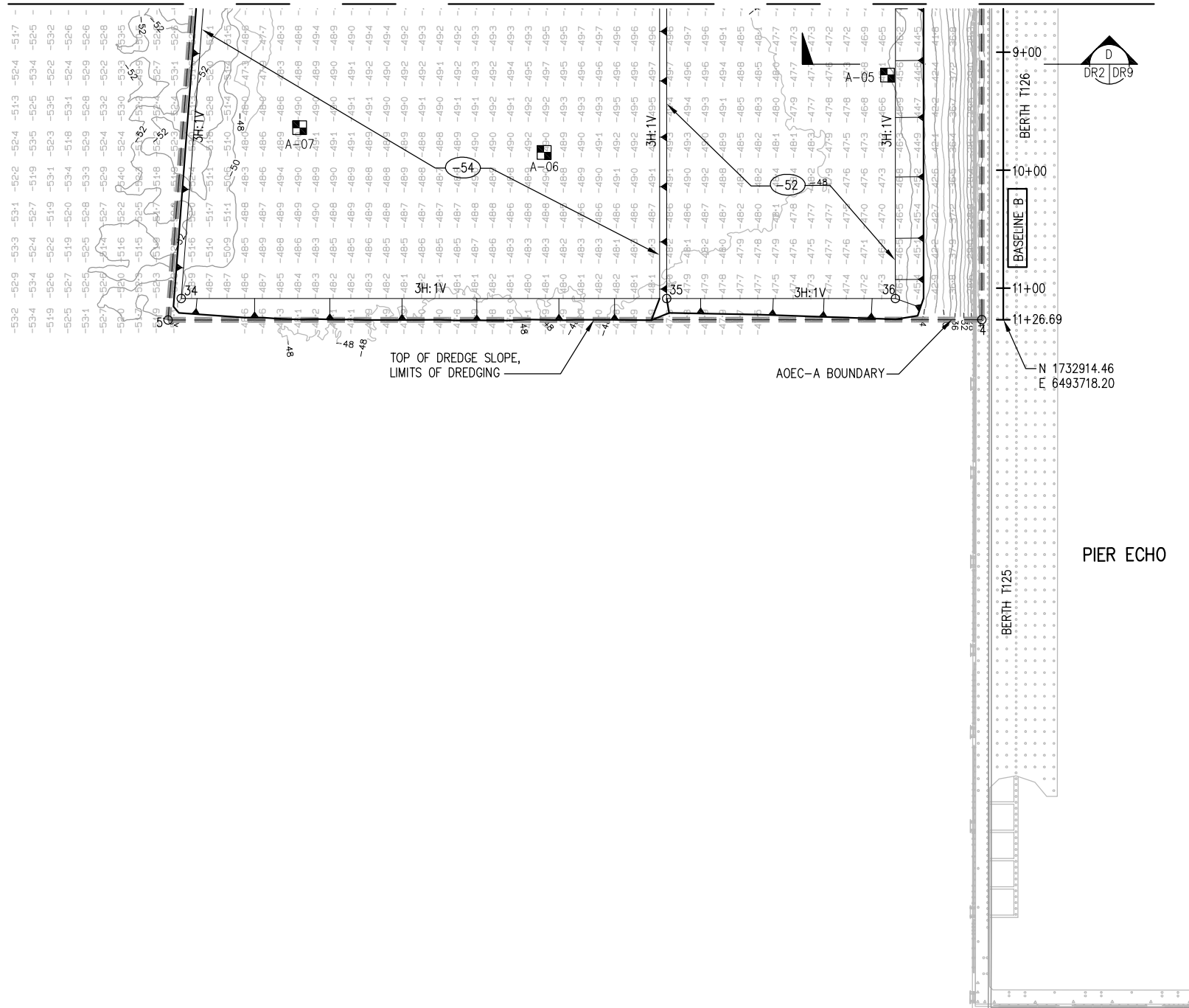
THE PORT OF LONG BEACH
925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
DREDGING PLAN AOEC-A PART 1

MARK DATE BY REVISIONS
DRAWN J.H. DATE 3/2009
DESIGNED D.B. P.E. NO.
PROJ. MGR. C.A. P.E. NO. C-44141
SECT. HEAD D.J.S. P.E. NO. C-46837

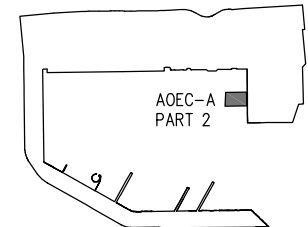
CHIEF HARBOR ENGINEER P.E. NO. C-25677, DATE

SEE DWG HD 10-1997-DR1










NOTES

1. ALL DREDGE SLOPES SHALL BE 3H:1V, UNLESS NOTED OTHERWISE.



KEY MAP
NTS

LEGEND

- | | |
|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
|  | BORING LOCATION. SEE BORING REPORT
DATED DECEMBER 17, 2007 BY
KLEINFELDER, INC. |
| A-01 | |
|  K-13 | BORING LOCATION. SEE DRAFT REPORT,
PRE-DESIGN SEDIMENT SAMPLING AT IR
SITE 7 DATED DECEMBER 17, 2007 BY
WESTON SOLUTIONS, INC. |
|  | TOP OF DREDGE SLOPE, LIMITS OF
DREDGING |
|  | AOEC BOUNDARY |
|  -40 | EXISTING CONTOUR |
|  -52 | PROJECT DREDGE DEPTH (MLLW) |
|  36 | DREDGE AREA CONTROL POINT |

FN: D1997DR2



400 Oceangate, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

SCALE
AS SHOWN

SHEET 6 OF 28

SPECIFICATION
NUMBER HD-S2319

DRAWING
NUMBER HD 10-1997-DR2



THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

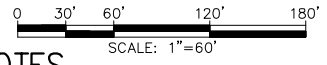
PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
DREDGING PLAN AOEC-A PART 2

MARK	DATE	BY	REVISIONS

DRAWN J.H. DATE 3/2009
DESIGNED D.B. P.E. NO. _____
PROJ. MGR. C.A. P.E. NO. C-44141
SECT. HEAD D.J.S. P.E. NO. C-46837

CHIEF HARBOR ENGINEER P.E. NO. C-25677 DATE _____

SEE PLAN CONTINUED AT RIGHT



SCALE
AS SHOWN SHEET 7 OF 28
SPECIFICATION
NUMBER HD-S2319
DRAWING
NUMBER HD 10-1997-DR3

FINAL SUBMITTAL SET

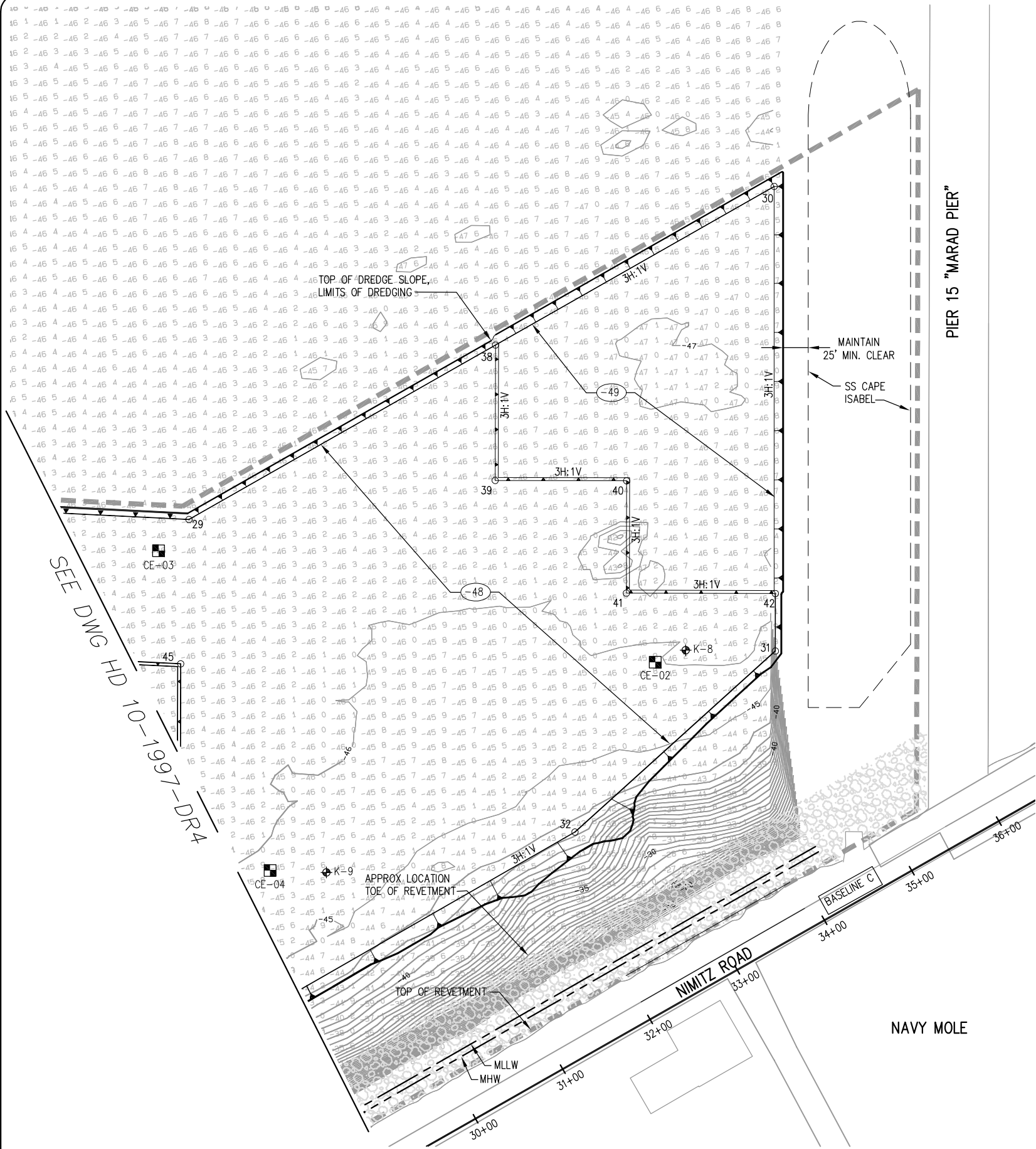
CHIEF HARBOR ENGINEER R.F. NO. C-25677 DATE


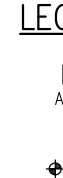

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

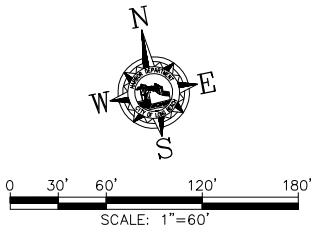
PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
DREDGING PLAN AOEC-C WEST

SCALE
AS SHOWN SHEET 7 OF 28
SPECIFICATION
NUMBER HD-S2319
DRAWING
NUMBER HD 10-1997-DR3

Plotted: Mar 17, 2009 -- 11:36am jhollenbach M:\2007\107224 - POLB- West Basin Dredge Drawings\CURRENT\01997-DR3-5 (DREDGE PLAN AREA C).dwg Layout Name: Layout3

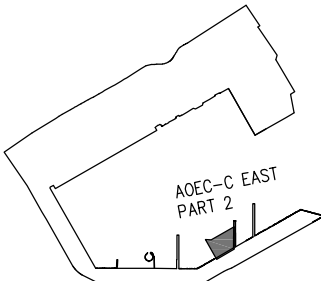


AOEC-C EAST & WEST DREDGE CONTROL POINTS					
POINT	NORTHING	EASTING	42	1729226	6492473
1	1729101	6489205	43	1729098	6491474
2	1729551	6489291	44	1729353	6491523
3	1729909	6490280	45	1729267	6491878
4	1729682	6490567	46	1729076	6491841
5	1729033	6490099	47	1728990	6491578
6	1728872	6490701	48	1729591	6491148
7	1728885	6490347	49	1729469	6491125
8	1729132	6490279	50	1729501	6490953
9	1729145	6490211	NOTE: DREDGE CONTROL POINTS REFER TO EITHER THE TOP OR TOE OF DREDGE SLOPE AS SHOWN ON THE DRAWINGS.		
10	1728984	6490046			
11	1729118	6489329			
12	1729596	6489419			
13	1729690	6489690			
14	1729052	6490100			
15	NOT USED				
16	1729731	6489770			
17	1729852	6490116			
18	1729447	6489716			
19	1729392	6490027			
20	1729367	6490159			
21	1729041	6490092			
22	1729124	6489652			
23	1729650	6490853			
24	1729027	6490739			
25	1729082	6490453			
26	1728821	6490683			
27	1728806	6490822			
28	1729632	6490978			
29	1729407	6491913			
30	1729625	6492548			
31	1729170	6492463			
32	1729029	6492233			
33	NOT USED				
34	1728712	6491317			
35	1729541	6490961			
36	1729516	6491093			
37	1729601	6491109			
38	1729521	6492245			
39	1729388	6492220			
40	1729364	6492349			
41	1729254	6492327			



NOTES

- ALL DREDGE SLOPES SHALL BE 3H:1V, UNLESS NOTED OTHERWISE.
- CONTRACTOR'S EQUIPMENT SHALL STAY CLEAR OF SS CAPE ISABEL AT PIER 15, "MARAD PIER" A DISTANCE OF 50 FEET WHILE DREDGING ALONG THE DREDGE LIMITS.



KEY MAP
NTS

LEGEND

- BORING LOCATION. SEE BORING REPORT DATED DECEMBER 17, 2007 BY KLEINFELDER, INC.
- BORING LOCATION. SEE DRAFT REPORT, PRE-DESIGN SEDIMENT SAMPLING AT IR SITE 7 DATED DECEMBER 17, 2007 BY WESTON SOLUTIONS, INC.
- TOP OF DREDGE SLOPE, LIMITS OF DREDGING
- AOEC BOUNDARY
- EXISTING CONTOUR
- PROJECT DREDGE DEPTH (MLLW)
- DREDGE AREA CONTROL POINT

FN: D1997DR5

k p f f Consulting Engineers
400 Oceanside, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200



THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

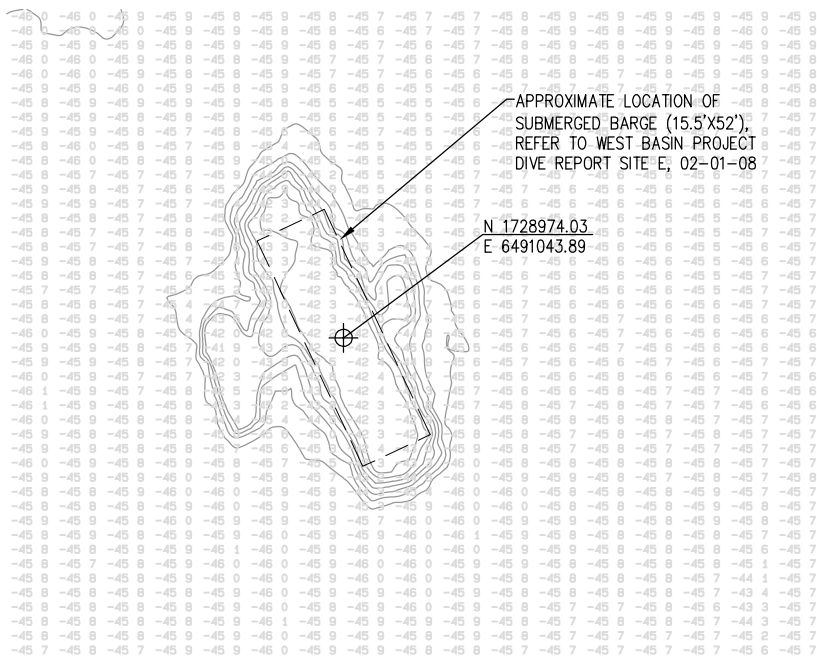
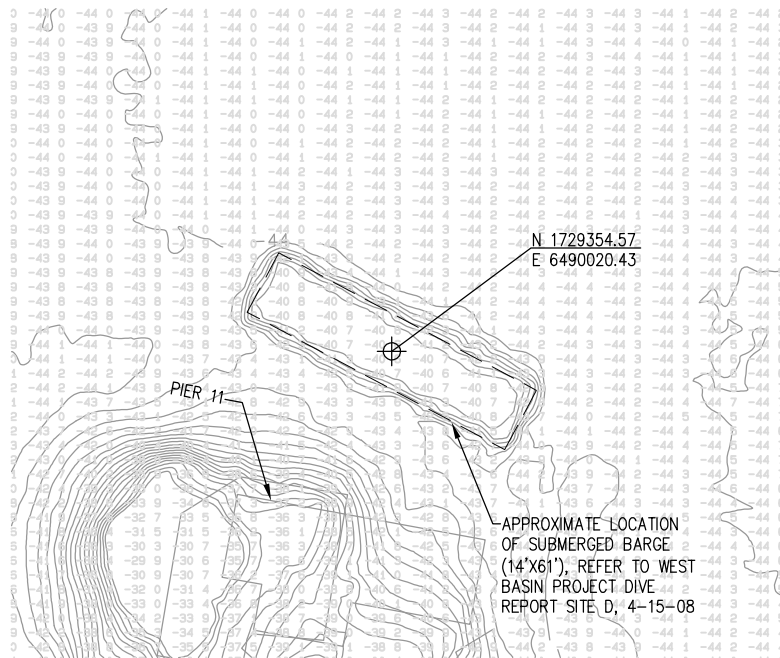
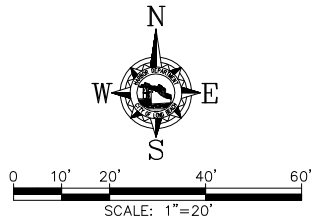
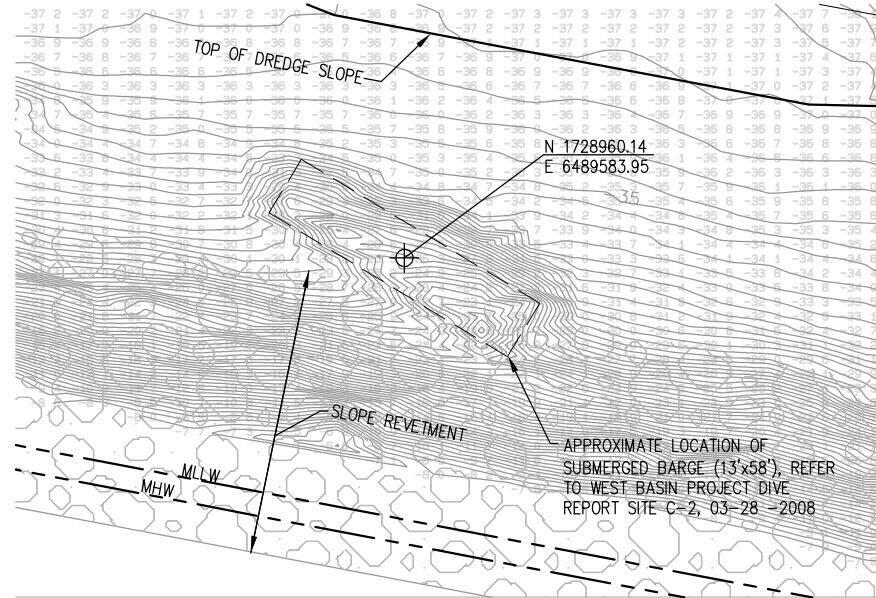
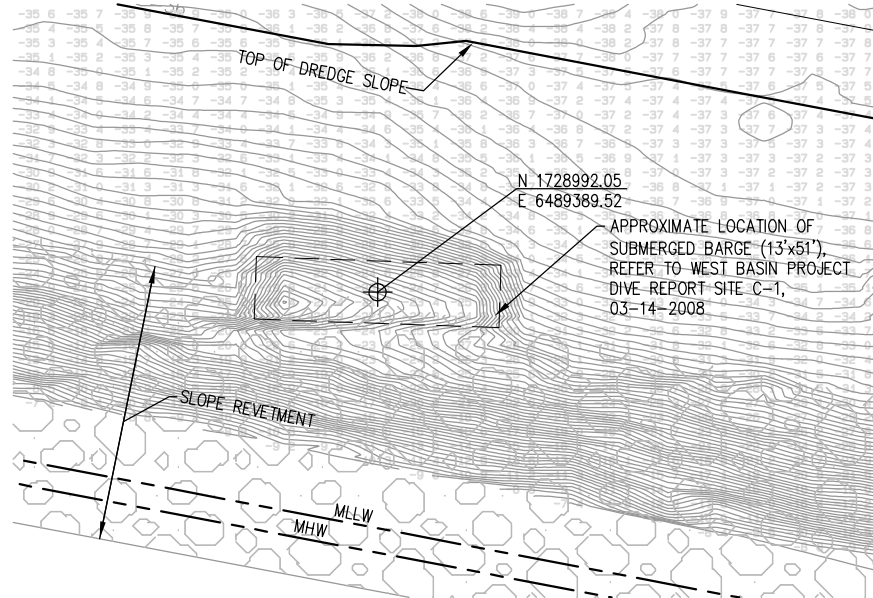
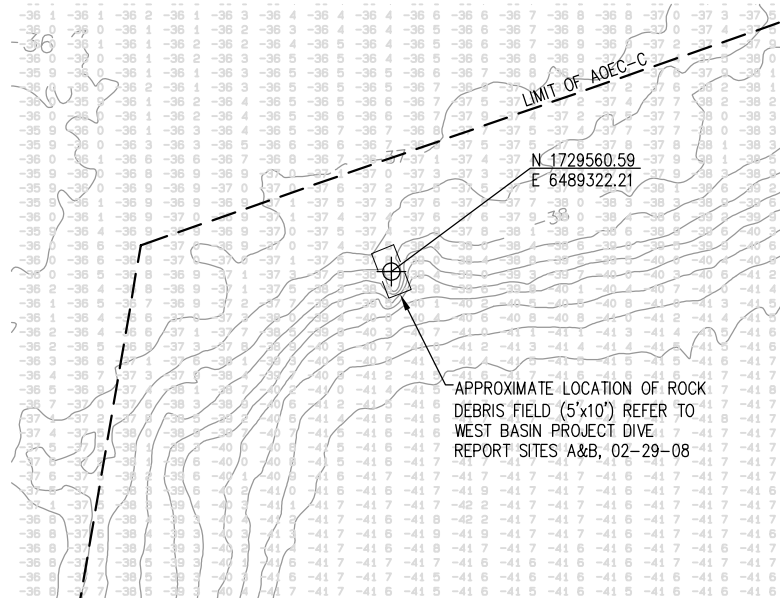
PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
DREDGING PLAN AOEC-C EAST PART 2

SCALE
AS SHOWN SHEET 9 OF 28
SPECIFICATION
NUMBER HD-S2319
DRAWING
NUMBER HD 10-1997-DR5

DRAWN J.H. DATE 3/2009
DESIGNED D.B. P.E. NO.
PROJ. MGR. C.A. P.E. NO. C-44141
SECT. HEAD D.J.S. P.E. NO. C-46837

CHIEF HARBOR ENGINEER P.E. NO. C-25677, DATE

Plotted: Mar 17, 2009 - 9:52am Jollenbach M:\2007\107224 - POLB- West Basin Dredge Drawings\CURRENT\1997-DR6 [DREDGE PLAN AREA C DETAILS].dwg Layout Name: Layout1



NOTES

- CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL SUBMERGED MATERIALS IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS. REFER TO SPECIFICATIONS FOR HANDLING, PROTECTIVE MEASURES AND DISPOSAL SITE LOCATIONS.
- CONTOURS SHOWN ON THIS SHEET WERE CREATED USING A 3'X10' GRID PATTERN AND ARE AT 6" INTERVALS.

MARK	DATE	BY	REVISIONS

DRAWN J.H. DATE 3/2009
DESIGNED D.B. P.E. NO. _____
PROJ. MGR. C.A. P.E. NO. C-44141
SECT. HEAD D.J.S. P.E. NO. C-46837

CHIEF HARBOR ENGINEER P.E. NO. C-25677, DATE _____



THE PORT OF LONG BEACH

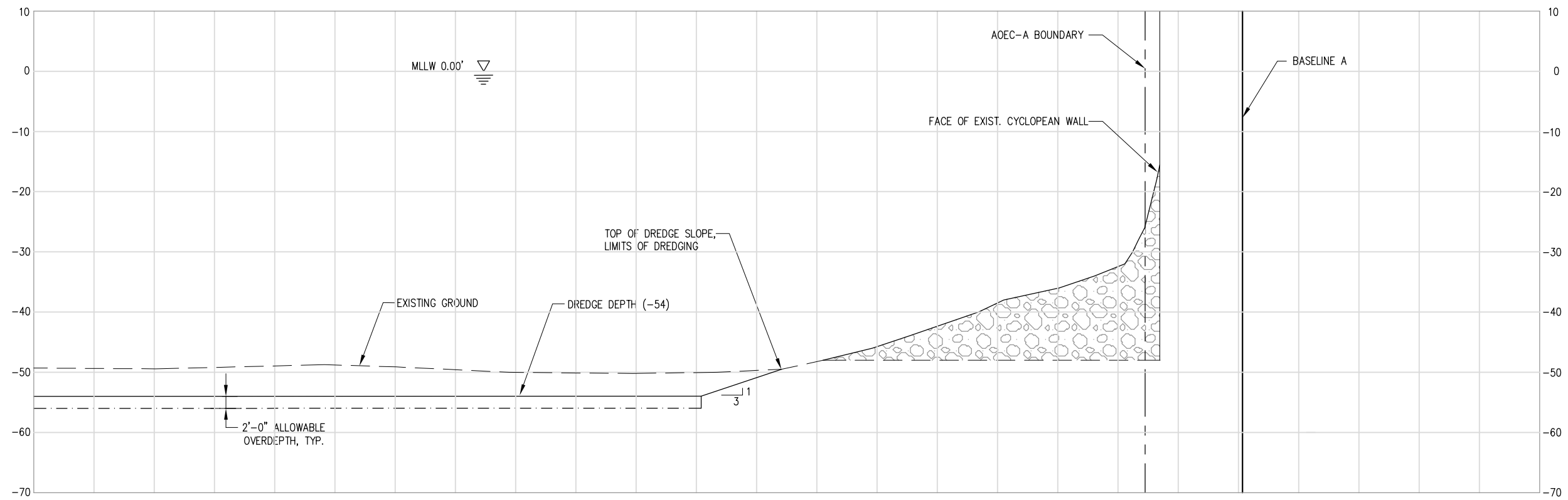
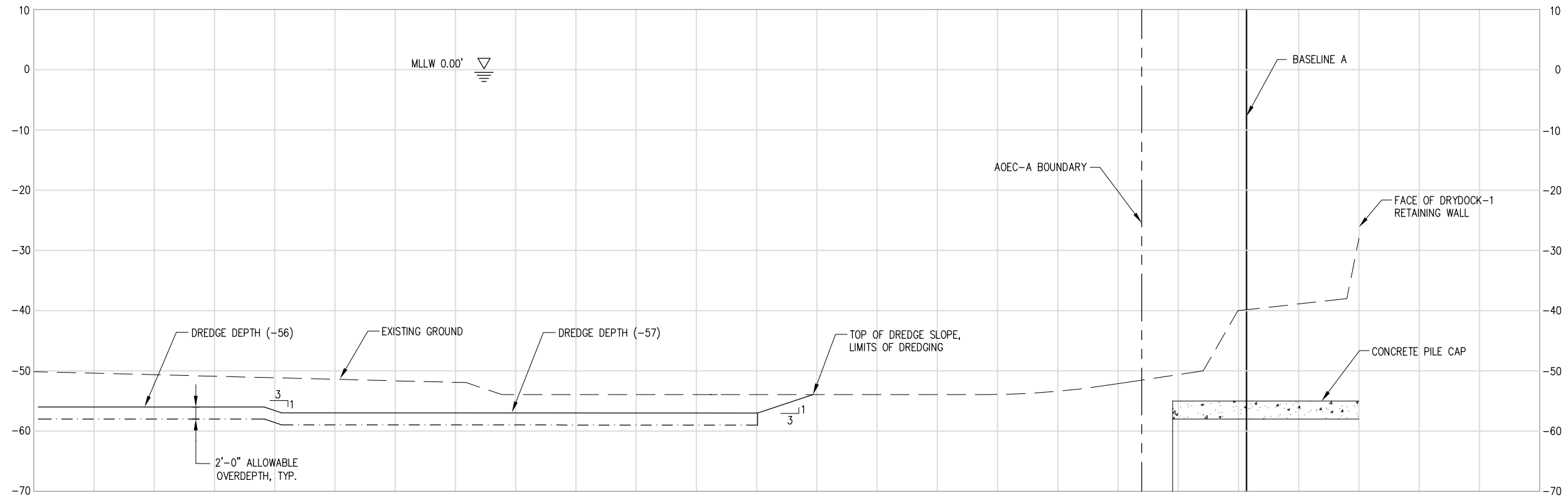
925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
DREDGING PLAN AOEC-C DETAILS

FN: D1997DR6
k p f f Consulting Engineers
400 Oceangate, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

SCALE AS SHOWN SHEET 10 OF 28
SPECIFICATION NUMBER HD-S2319
DRAWING NUMBER HD 10-1997-DR6

Plotted: Mar 17, 2009 -- 11:10am jhollenbach M:\2007\107224 - POLB- West Basin Dredge\Drawings\CURRENT\1997-DR7-9 (SECTION AREA A).dwg Layout Name: Layout1



0 5' 10' 20' 30'
HORIZ. AND VERT. SCALE: 1"=10'

FN: D1997DR6

kpff Consulting Engineers
400 Oceangate, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

MARK	DATE	BY	REVISIONS

DRAWN J.H. DATE 3/2009
DESIGNED D.B. P.E. NO.
PROJ. MGR. C.A. P.E. NO. C-44141
SECT. HEAD D.J.S. P.E. NO. C-46837

CHIEF HARBOR ENGINEER P.E. NO. C-25677 DATE



THE PORT OF LONG BEACH

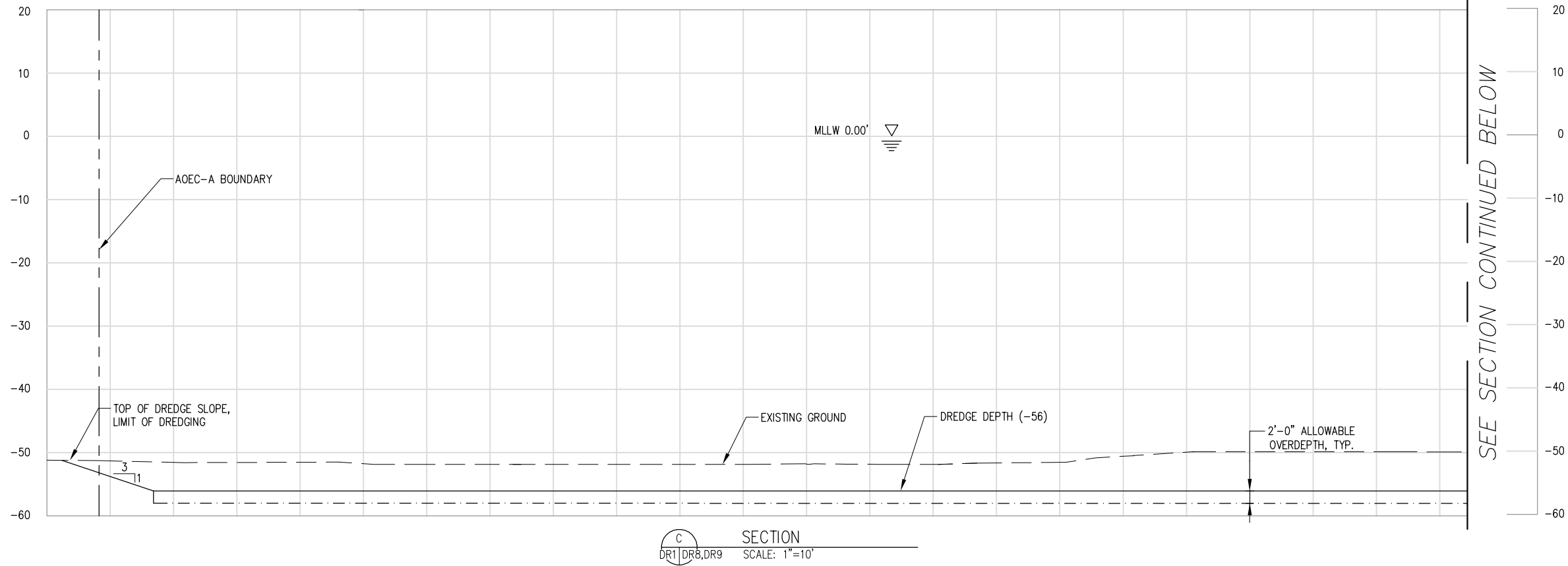
925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
DREDGING PLAN AOEC-A NO. 1

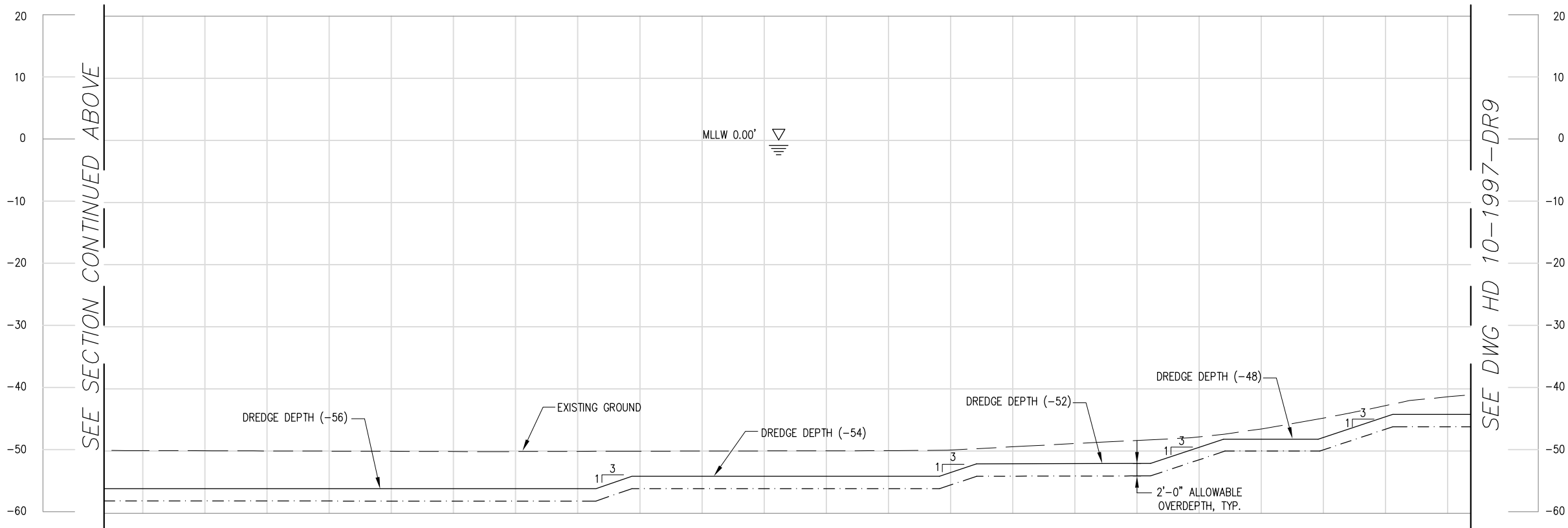
SCALE AS SHOWN SHEET 11 OF 28
SPECIFICATION NUMBER HD-S2319
DRAWING NUMBER HD 10-1997-DR7

FINAL SUBMITTAL SET

Plotted: Mar 17, 2009 -- 11:10am jpollenbach M:\2007\107224 - POLB- West Basin Dredge\Drawings\CURRENT\1997-DR7-9 (SECTION AREA A).dwg Layout Name: Layout2



C
DR1 DR8, DR9
SECTION
SCALE: 1"=10'



C
DR1 DR8, DR9
SECTION
SCALE: 1"=10'

0 5' 10' 20' 30'
HORIZ. AND VERT. SCALE: 1"=10'

MARK	DATE	BY	REVISIONS

DRAWN J.H. DATE 3/2009
DESIGNED D.B. P.E. NO.
PROJ. MGR. C.A. P.E. NO. C-44141
SECT. HEAD D.J.S. P.E. NO. C-46837

CHIEF HARBOR ENGINEER P.E. NO. C-25677 DATE



THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

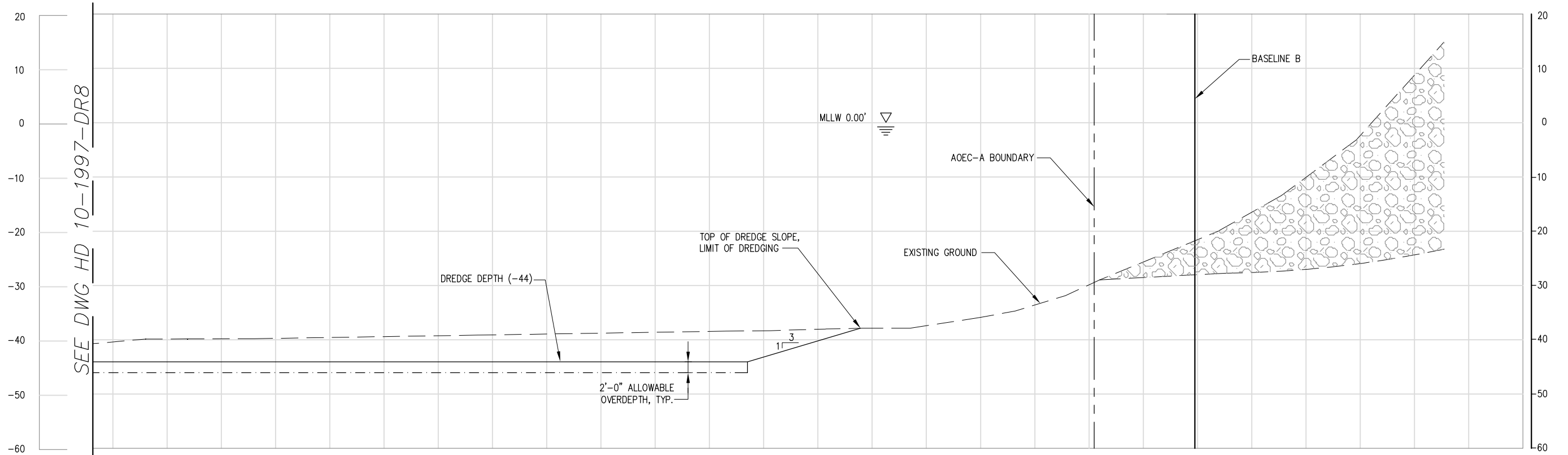
PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
DREDGING PLAN AOEC-A NO. 2

k p f f Consulting Engineers
400 Oceangate, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

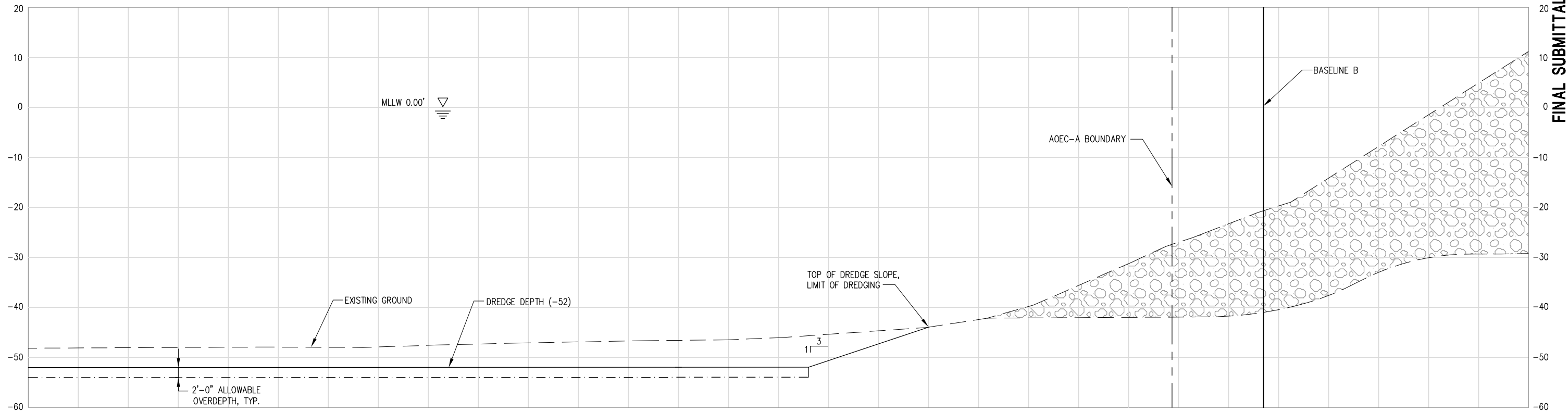
SCALE AS SHOWN SHEET 12 OF 28
SPECIFICATION NUMBER HD-S2319
DRAWING NUMBER HD 10-1997-DR8

FINAL SUBMITTAL SET

Plotted: Mar 17, 2009 -- 11:11am jhollenbach M:\2007\107224 - POLB- West Basin Dredge Drawings\CURRENT\1997-DR7-9 (SECTION AREA A).dwg Layout Name: Layout3



C
DR1|DR8,DR9 SECTION
SCALE: 1"=10'



D
DR2|DR9 SECTION
SCALE: 1"=10'

0 5' 10' 20' 30'
HORIZ. AND VERT. SCALE: 1"=10'

FN: D1997DR6

FINAL SUBMITTAL SET

MARK	DATE	BY	REVISIONS

DRAWN	J.H.	DATE	3/2009
DESIGNED	D.B.	P.E. NO.	
PROJ. MGR.	C.A.	P.E. NO.	C-44141
SECT. HEAD	D.J.S.	P.E. NO.	C-46837

CHIEF HARBOR ENGINEER	P.E. NO.	C-25677	DATE	
-----------------------	----------	---------	------	--



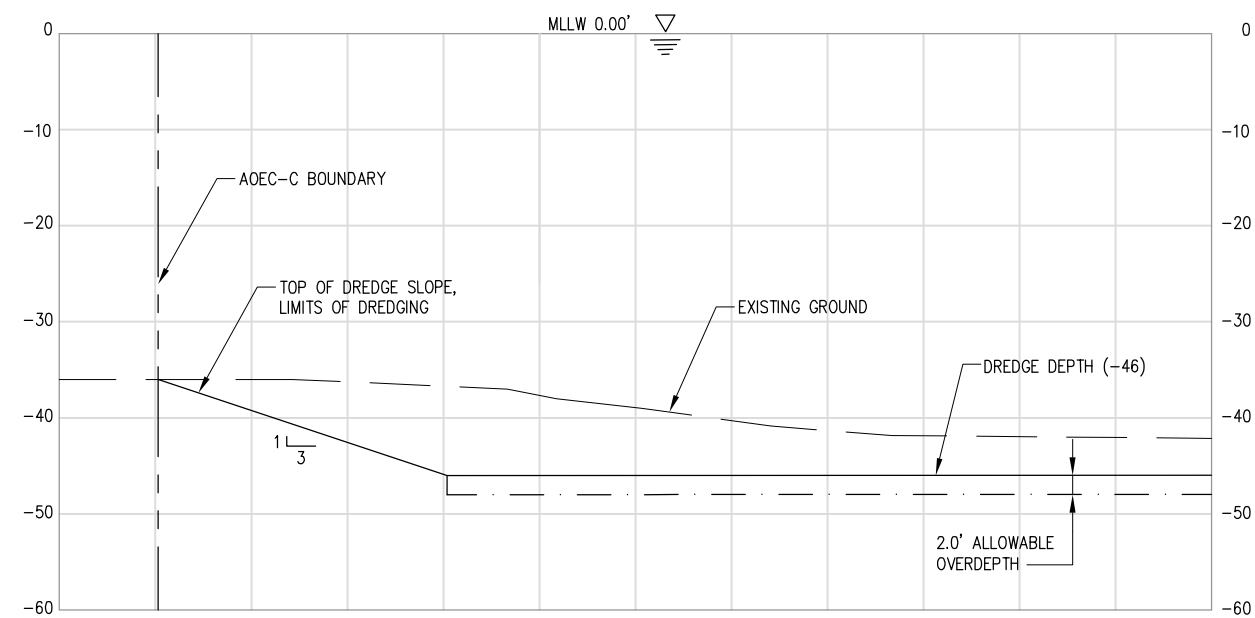
THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

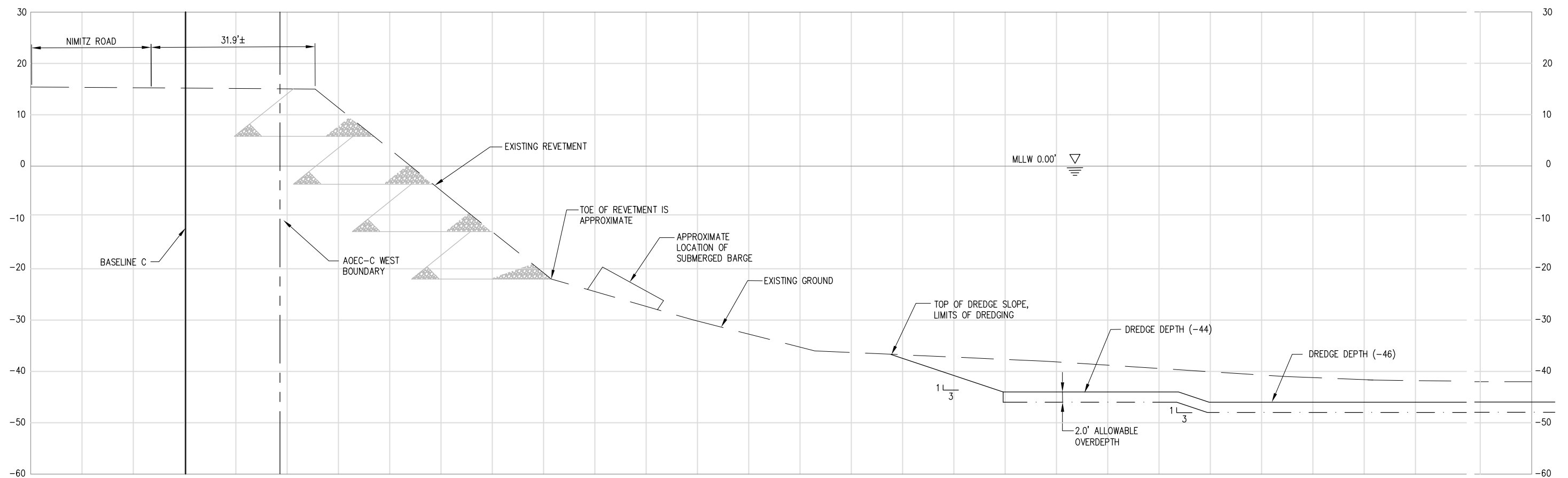
PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
DREDGING PLAN AOEC-A NO. 3

k p f f Consulting Engineers
400 Oceangate, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

SCALE
AS SHOWN SHEET 13 OF 28
SPECIFICATION NUMBER
HD-S2319
DRAWING NUMBER
HD 10-1997-DR9









Case#: D1997DR10



k p f f Consulting Engineers
400 Oceangate, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

						DRAWN	J.H.	DATE	3/2009		
						DESIGNED	D.B.	P.E. NO.			
						PROJ. MGR.	C.A.	P.E. NO.	C-44141		
						SECT. HEAD	D.S.	P.E. NO.	C-46837		
MARK	DATE	BY			REVISIONS					CHIEF HARBOR ENGINEER	P.E. NO. C-25677 DATE



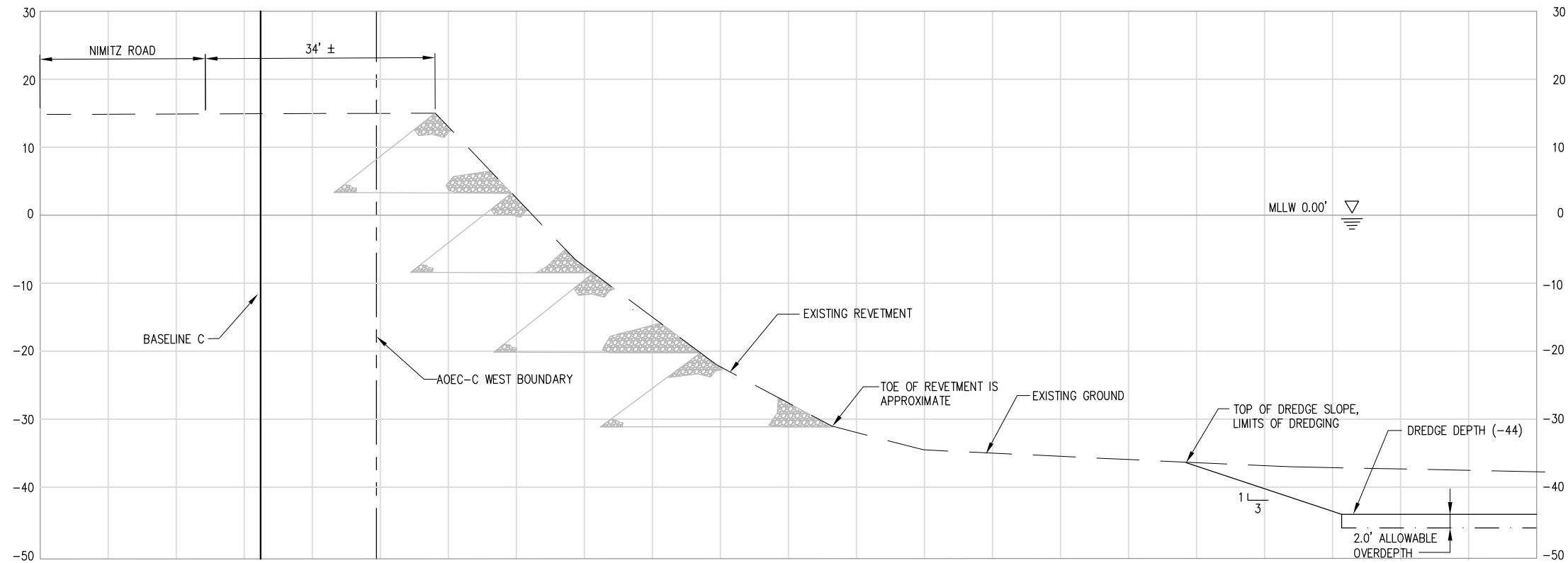
THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

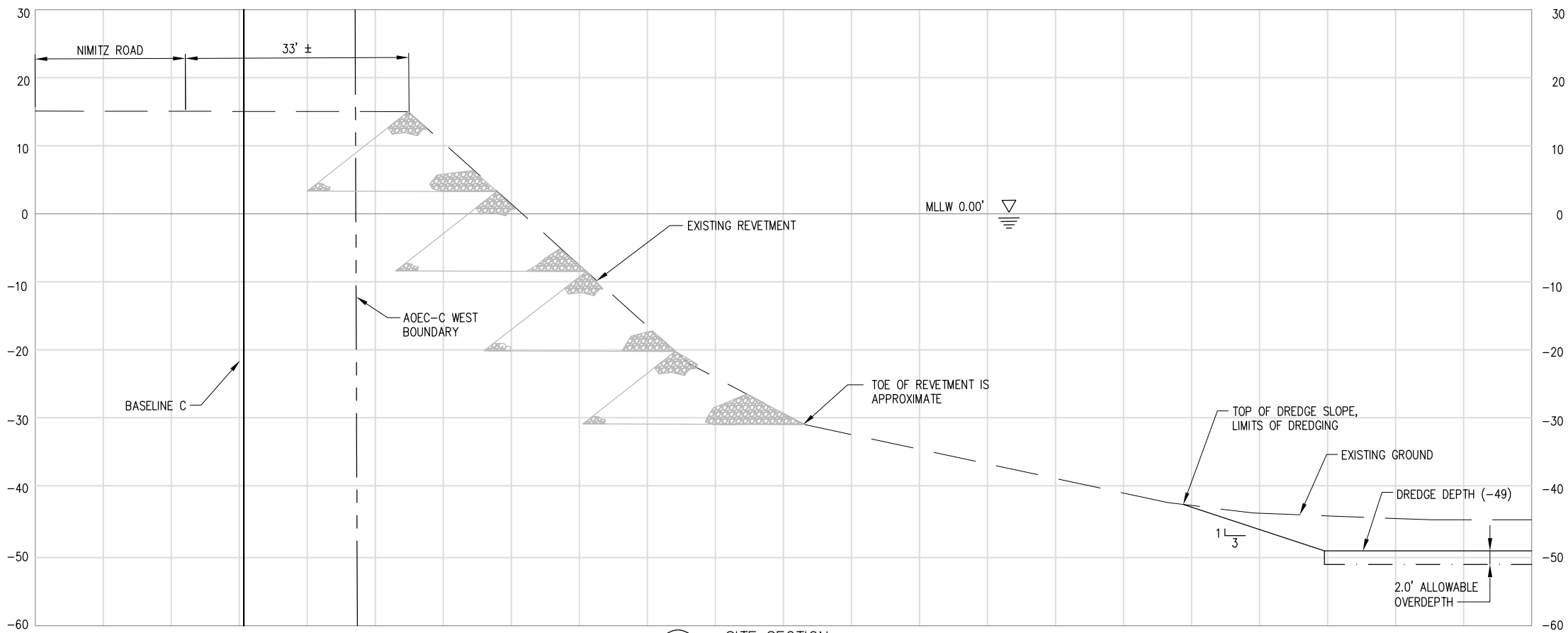
PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
DREDGING SECTIONS AOEC-C WEST NO. 1

SCALE
AS SHOWN SHEET 14 OF 28
SPECIFICATION
NUMBER HD-S2319
DRAWING
NUMBER HD 10-1997-DR10

Plotted: Mar 17, 2009 -- 10:09am jhollerbach M:\2007\107224 - POLB- West Basin Dredge Drawings\CURRENT\01997-DR10-14 (SECTION AREA C).dwg Layout Name: DR11



C
DR3 | DR11
SITE SECTION
SCALE: 1"=10'



D
DR3 | DR11
SITE SECTION
SCALE: 1"=10'

0 5' 10' 20' 30'
HORIZ. AND VERT. SCALE: 1"=10'

MARK	DATE	BY	REVISIONS

DRAWN J.H. DATE 3/2009
DESIGNED D.B. P.E. NO. _____
PROJ. MGR. C.A. P.E. NO. C-44141
SECT. HEAD D.J.S. P.E. NO. C-46837

CHIEF HARBOR ENGINEER P.E. NO. C-25677, DATE _____



THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
DREDGING SECTIONS AOEC-C WEST NO. 2

SCALE AS SHOWN SHEET 15 OF 28
SPECIFICATION NUMBER HD-S2319
DRAWING NUMBER HD 10-1997-DR11

kpff Consulting Engineers
400 Oceangate, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

FN: D1997DR11

FINAL SUBMITTAL SET



FN: D1997DR12



THE PORT OF LONG BEACH

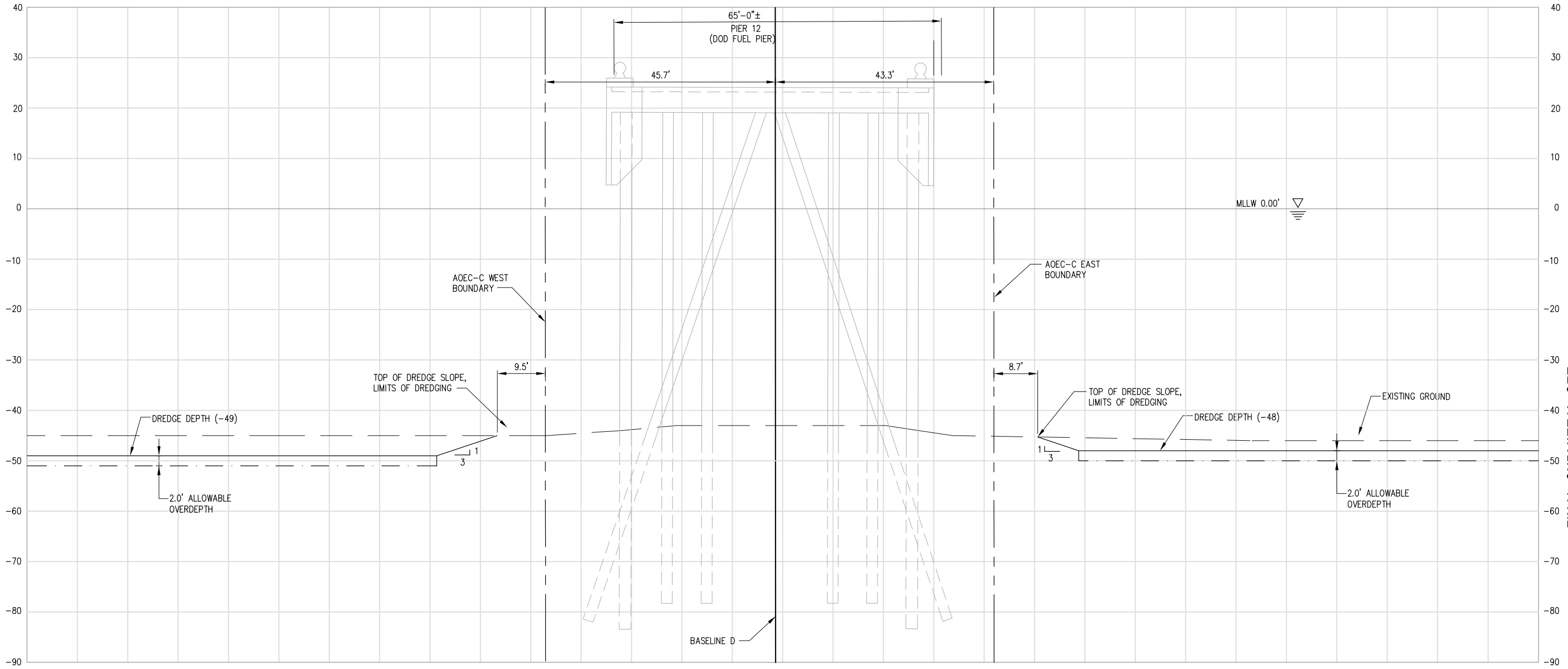
925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

SCALE
AS SHOWN SHEET 16 OF 28

SPECIFICATION
NUMBER HD-S2319

DRAWING
NUMBER HD 10-1997-DR12

Plotted: Mar 17, 2009 -- 10:13am jhollenbach M:\2007\107224 - POLB- West Basin Dredge Drawings\CURRENT\DR10-14 (SECTION AREA C).dwg Layout Name: DR13



DR3,DR4 | DR13 **F** SITE SECTION
SCALE: 1"=10'



FN: D1997DR13
k p f f Consulting Engineers
400 Oceangate, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

MARK	DATE	BY	REVISIONS

DRAWN	J.H.	DATE	3/2009
DESIGNED	D.B.	P.E. NO.	
PROJ. MGR.	C.A.	P.E. NO.	C-44141
SECT. HEAD	D.J.S.	P.E. NO.	C-46837

CHIEF HARBOR ENGINEER	P.E. NO.	C-25677	DATE	
-----------------------	----------	---------	------	--

THE PORT OF LONG BEACH
925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
DREDGING SECTIONS AOEC-C EAST NO. 2

SCALE
AS SHOWN SHEET 17 OF 28
SPECIFICATION NUMBER HD-S2319
DRAWING NUMBER HD 10-1997-DR13



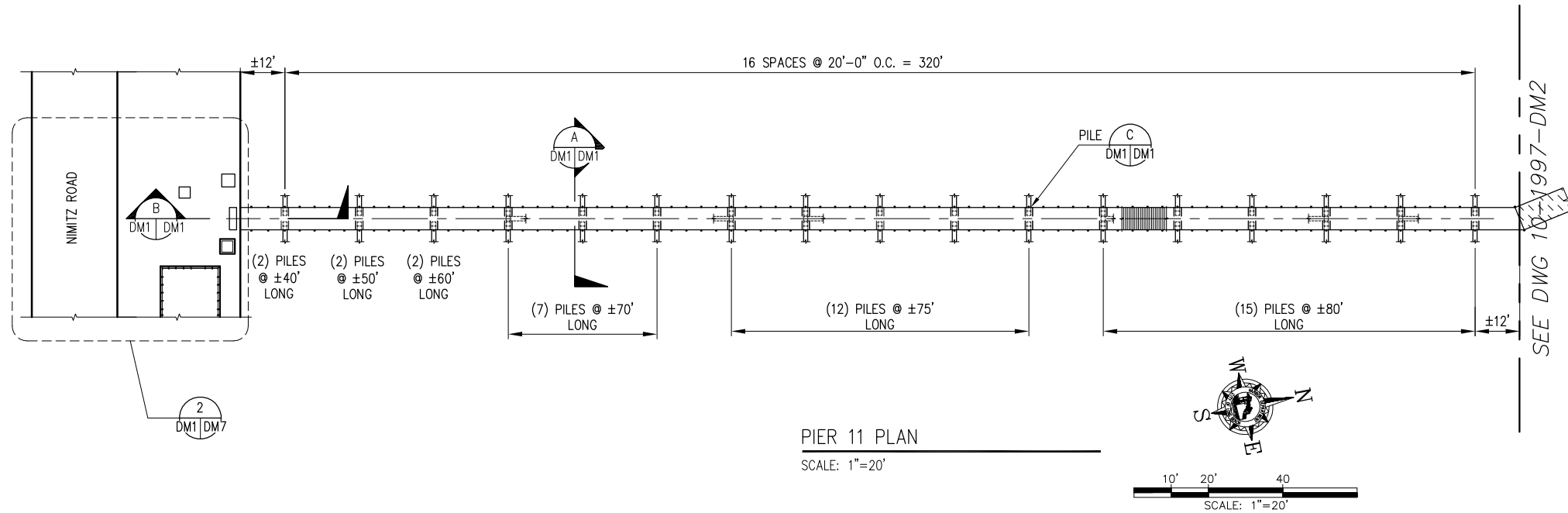
SCALE
AS SHOWN SHEET 18 OF 28

SPECIFICATION
NUMBER HD-S2319

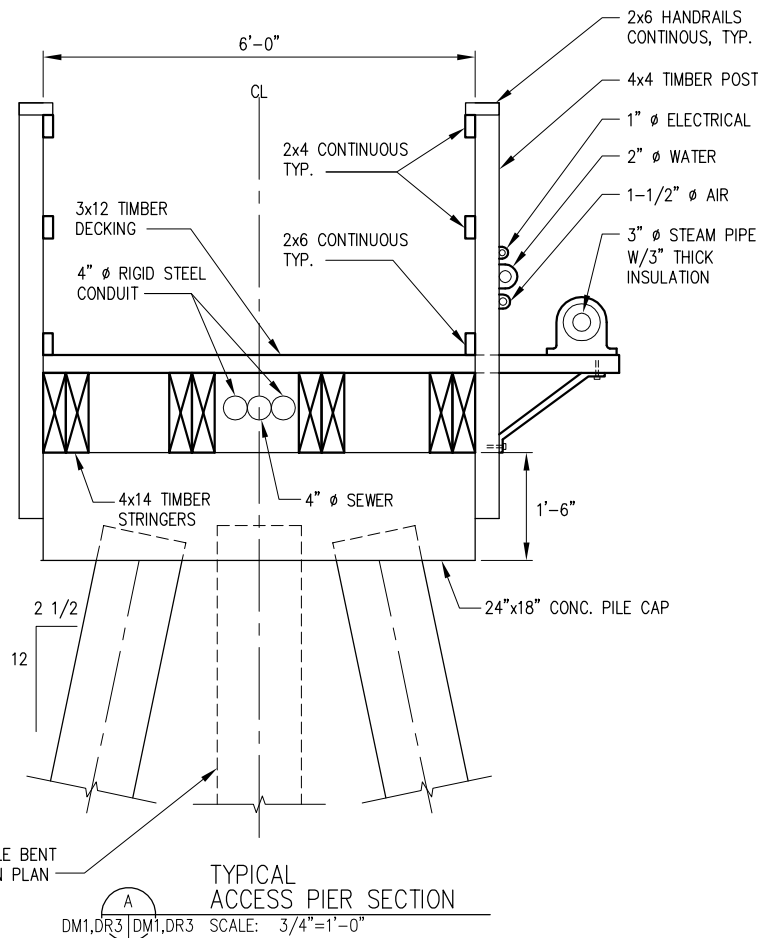
DRAWING
NUMBER HD 10-1997-DR14

				DRAWN	J.H.	DATE	3/2009				
				DESIGNED	D.B.	P.E. NO.					
				PROJ. MGR.	C.A.	P.E. NO.	C-44141				
				SECT. HEAD	D.J.S.	P.E. NO.	C-46837				
MARK	DATE	BY	REVISIONS					CHIEF HARBOR ENGINEER	P.E. NO. C-25677	DATE	

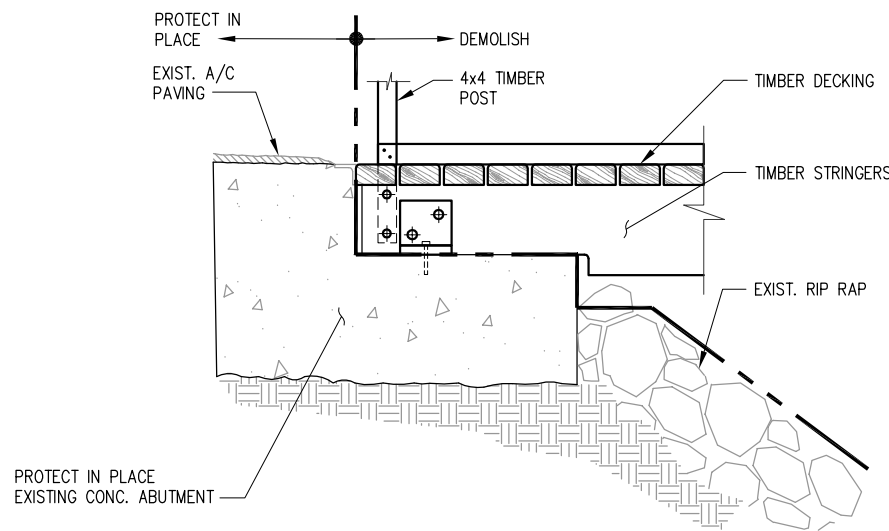
Plotted: Mar 17, 2009 - 10:17am jhollenbach M:\2007\107224 - POLB- West Basin Dredge\Drawings\CURRENT\1997-DM1 (PIER 11 PLAN & DETAILS).dwg Layout Name: DM1



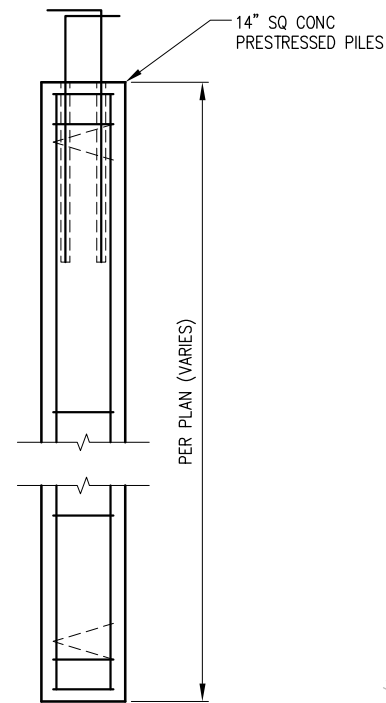
PIER 11 PLAN
SCALE: 1"=20'



TYPICAL
ACCESS PIER SECTION
SCALE: 3/4"=1'-0"



ABUTMENT DETAIL
SCALE: 1"=1'-0"



PILE SECTION
SCALE: 3/4"=1'-0"

REFERENCE DRAWINGS NOTE

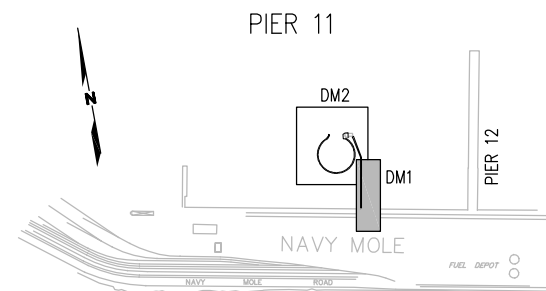
CONTRACTOR SHALL REVIEW ALL PIER 11 PLANS AND DETAILS REFERENCED IN THE APPENDIX OF THE SPECIFICATIONS TO FULLY DETERMINE THE NECESSARY WORK THAT WILL BE REQUIRED TO DEMOLISH THE STRUCTURE WITHIN THE LIMITS INDICATED ON THESE DRAWINGS. WHEREVER A SECTION IS SHOWN, IT IS PROVIDED TO GENERALLY SHOW THE DEPTH TO WHICH FOUNDATION AND UNDERGROUND STRUCTURES ARE TO BE REMOVED. SECTIONS DO NOT ACCURATELY REFLECT THE EXISTING CONFIGURATION OF THE PIER. CONTRACTOR MUST REVIEW THE PUBLIC WORKS DRAWINGS AND VISIT THE SITE TO MORE ACCURATELY DETERMINE THE SCOPE OF WORK PRIOR TO BID.

NOTES

- SECTIONS SHOWN FOR REFERENCE ONLY. ALL CONCRETE IS REINFORCED. CONTRACTOR SHALL BE RESPONSIBLE FOR DEMOLITION AND COMPLETE REMOVAL OF ALL EXISTING PILES (NOT BROKEN OFF) AND PIER STRUCTURE.
- DEMOLITION ITEM CALLOUTS HEREON ARE REPRESENTATIVE OF WHAT IS TO BE DONE, NOT AN ITEMIZED ACCOUNTING FOR EACH ITEM TO BE DEMOLISHED, REMOVED AND DISPOSED OF.
- HAZARDOUS MATERIALS ARE NOT IDENTIFIED IN THIS PIER 11 DEMOLITION DRAWING. SEE HAZARDOUS MATERIAL ABATEMENT DRAWINGS TO IDENTIFY DEMOLITION ITEMS THAT ARE POTENTIALLY HAZARDOUS AND REQUIRE HANDLING OR ABATEMENT PRIOR TO DEMOLITION.
- ALL UTILITIES SHOWN IN SECTIONS ARE INSTALLED THE ENTIRE PIER LENGTH. ALL UTILITIES ASSOCIATED WITH PIER 11 SHALL BE REMOVED AND PERMANENTLY CAPPED AT FACE OF MOLE AND/ OR FACE OF ABUTMENT, UNLESS OTHERWISE NOTED.
- ALL DEMOLITION SHALL BE COMPLETE PRIOR TO DREDGING IN THE AREA
- ALL MISCELLANEOUS FEEDERS ASSOCIATED WITH PIER 11 SHALL BE TERMINATED AT A LOCATION DETERMINED BY THE ENGINEER.

DEMOLITION KEY NOTES

UNLESS OTHERWISE INDICATED ON THIS PLAN, COMPLETELY DEMOLISH, REMOVE AND DISPOSE OF ALL THE ELEMENTS OF THE PIER STRUCTURE PILE CAPS AND PILES, INCLUDING UTILITIES. PILES SHALL BE COMPLETELY REMOVED AND NOT BROKEN OFF. REFER TO SPECIFICATION SECTION 02050, PAR.3.05C



KEY MAP
NTS

FN: D1997DM1

k p f f Consulting Engineers
400 Oceangate, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

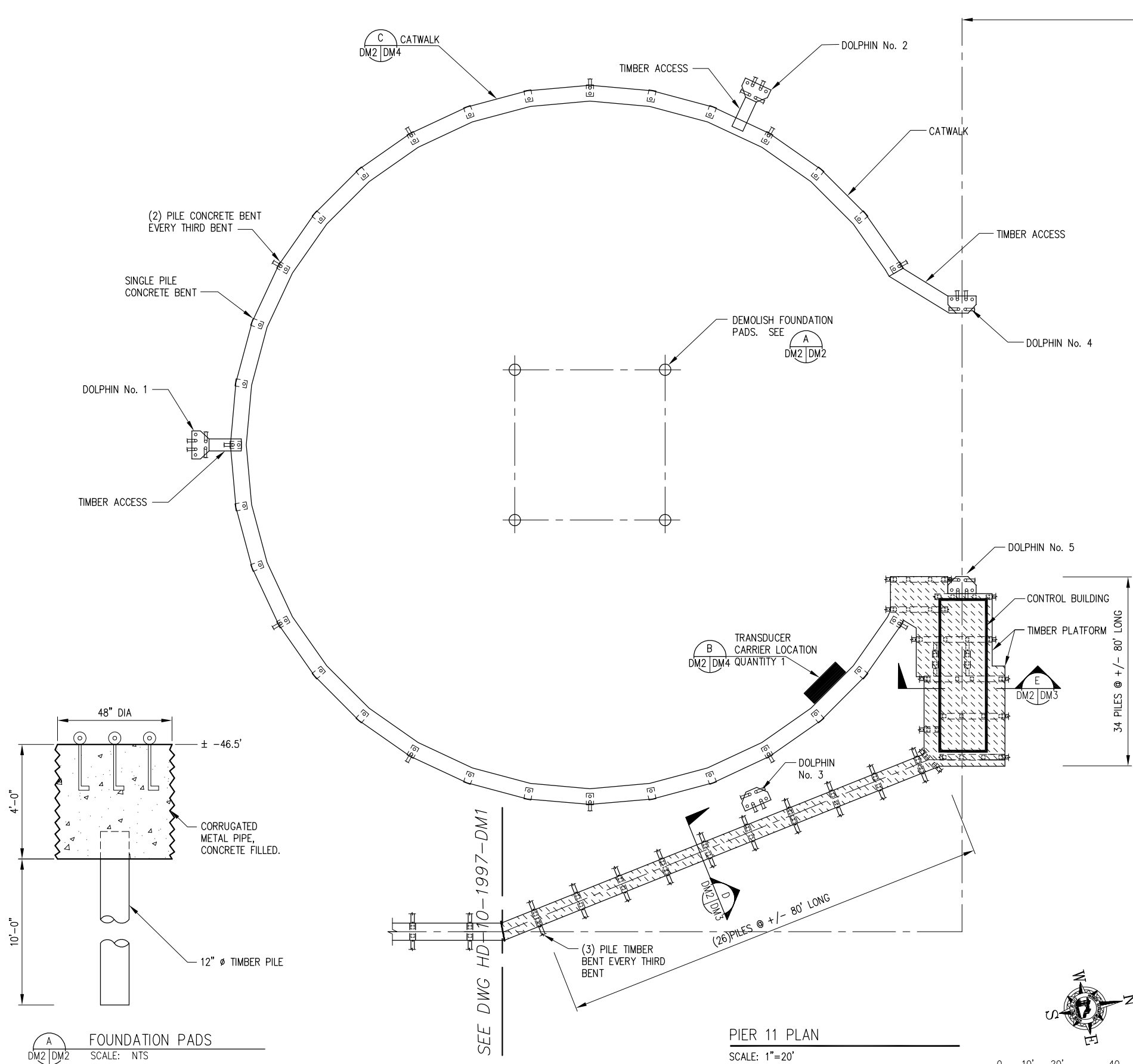
THE PORT OF LONG BEACH
925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
PIER 11 DEMOLITION PLAN

SCALE
AS SHOWN SHEET 19 OF 28
SPECIFICATION NUMBER HD-S2319
DRAWING NUMBER HD-10-1997-DM1

FINAL SUBMITTAL SET

Plotted: Mar 17, 2009 - 10:26am jhollerbach M:\2007\107224 - POLB- West Basin Dredge Drawings\CURRENT\01997-DW2 (SONAR RING PLAN).dwg Layout Name: Layout1



NOTES

1. SECTIONS SHOWN FOR REFERENCE ONLY. ALL CONCRETE IS REINFORCED. CONTRACTOR SHALL BE RESPONSIBLE FOR DEMOLITION AND REMOVAL OF ALL EXISTING PILES AND PIER STRUCTURE.
2. DEMOLITION ITEM CALLOUTS HEREON ARE REPRESENTATIVE OF WHAT IS TO BE DONE, NOT AN ITEMIZED ACCOUNTING FOR EACH ITEM TO BE DEMOLISHED, REMOVED AND DISPOSED OF.
3. HAZARDOUS MATERIALS ARE NOT IDENTIFIED IN THIS PIER 11 DEMOLITION DRAWING. SEE HAZARDOUS MATERIAL ABATEMENT DRAWINGS TO IDENTIFY DEMOLITION ITEMS THAT ARE POTENTIALLY HAZARDOUS AND REQUIRE HANDLING OR ABATEMENT PRIOR TO DEMOLITION.
4. ALL UTILITIES ASSOCIATED WITH PIER 11 SHALL BE PERMANENTLY CAPPED AT FACE OF MOLE AND/ OR FACE OF ABUTMENT, UNLESS OTHERWISE NOTED.
5. ALL DEMOLITION SHALL BE COMPLETE PRIOR TO DREDGING IN THE AREA
6. ALL MISCELLANEOUS FEEDERS ASSOCIATED WITH PIER 11 SHALL BE TERMINATED AT A LOCATION DETERMINED BY THE ENGINEER.

DEMOLITION KEY NOTES

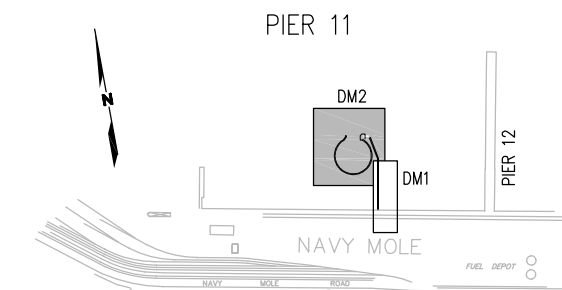
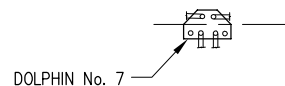
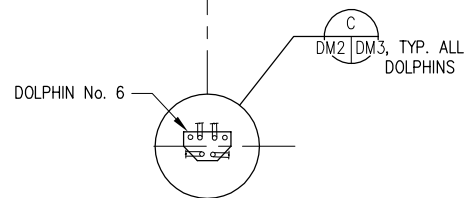
UNLESS OTHERWISE INDICATED ON THIS PLAN, COMPLETELY DEMOLISH, REMOVE OR DISPOSE OF ALL THE ELEMENTS OF THE PIER STRUCTURE PILE CAPS AND PILES, INCLUDING UTILITIES.

LEGEND

 INDICATES STRUCTURE SUBMERGED.



0 10' 20' 40' 60'
SCALE: 1"=20'



KEY MAP

NTS

FN: D1997DM2

k p f f Consulting Engineers
400 Oceanside, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

SCALE AS SHOWN SHEET 20 OF 28
SPECIFICATION NUMBER HD-S2319
DRAWING NUMBER HD_10-1997-DW2

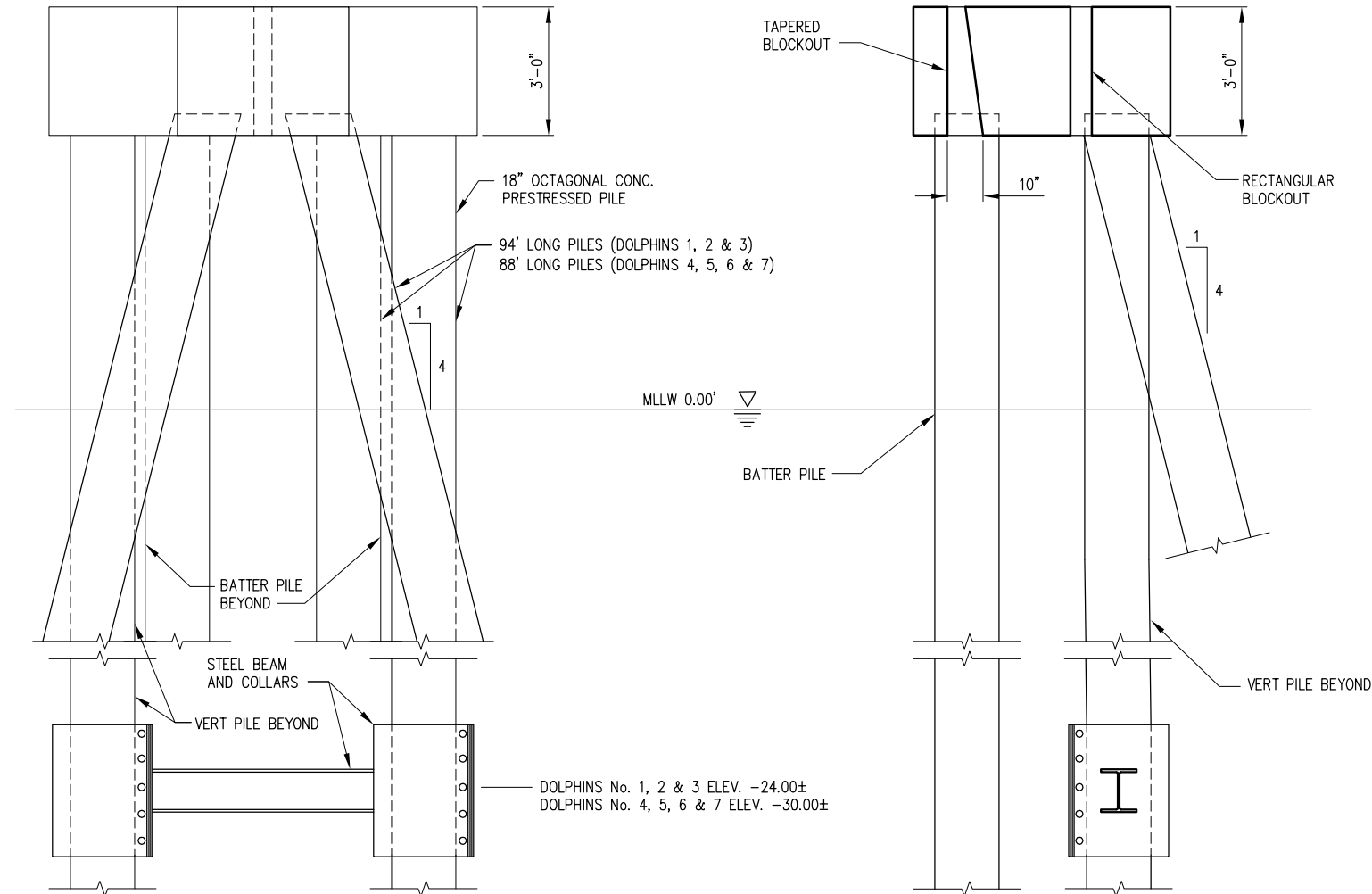
THE PORT OF LONG BEACH
925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
PIER 11 DEMOLITION PLAN

DRAWN J.H. DATE 1/2008
DESIGNED J.L. P.E. NO.
PROJ. MGR. S.G. P.E. NO.
SECT. HEAD D.J.S. P.E. NO. C-46837

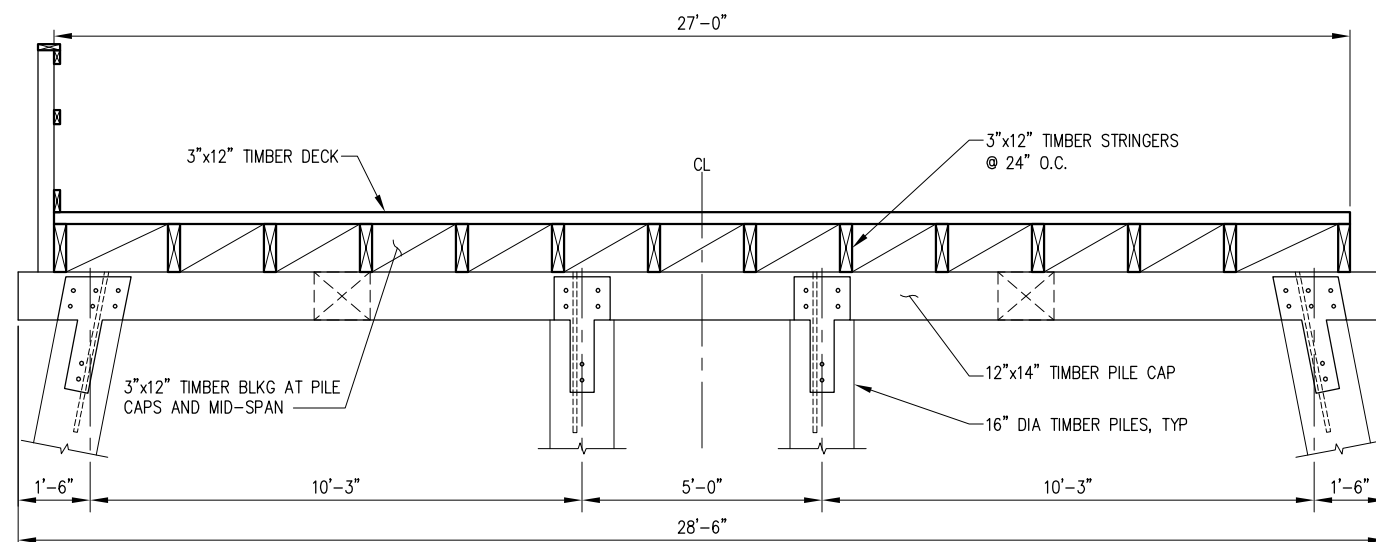
CHIEF HARBOR ENGINEER P.E. NO. C-25677, DATE

Plotted: Mar 17, 2009 -- 10:35am jhollerbach M:\2007\107224 - POLB- West Basin Dredge Drawings\CURRENT\01997-DM3 (DOLPHIN DETAILS).dwg Layout Name: Layout1

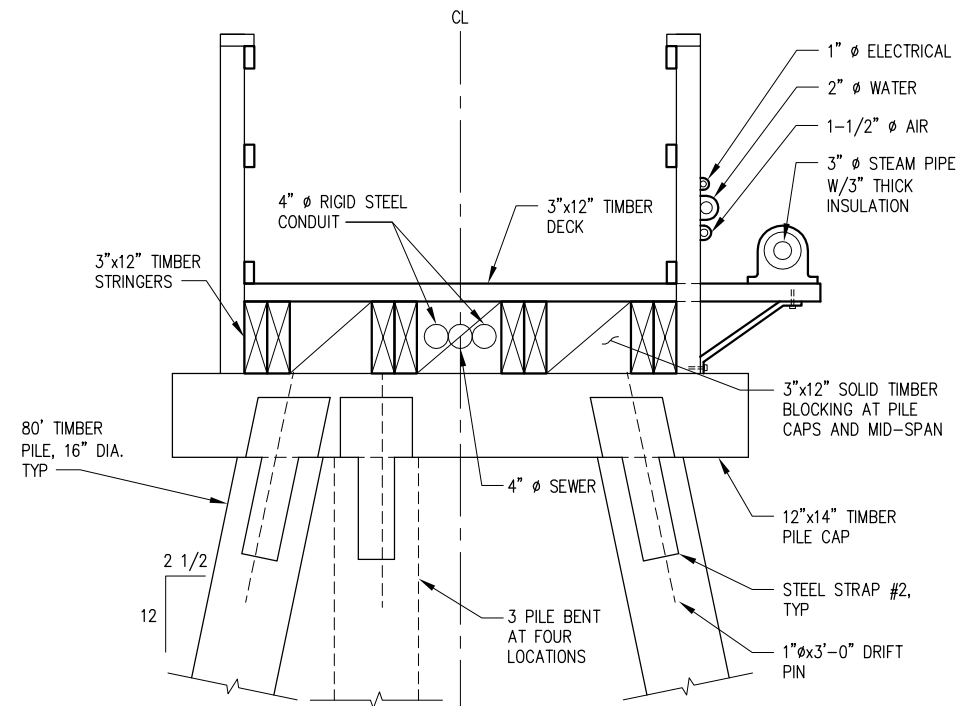
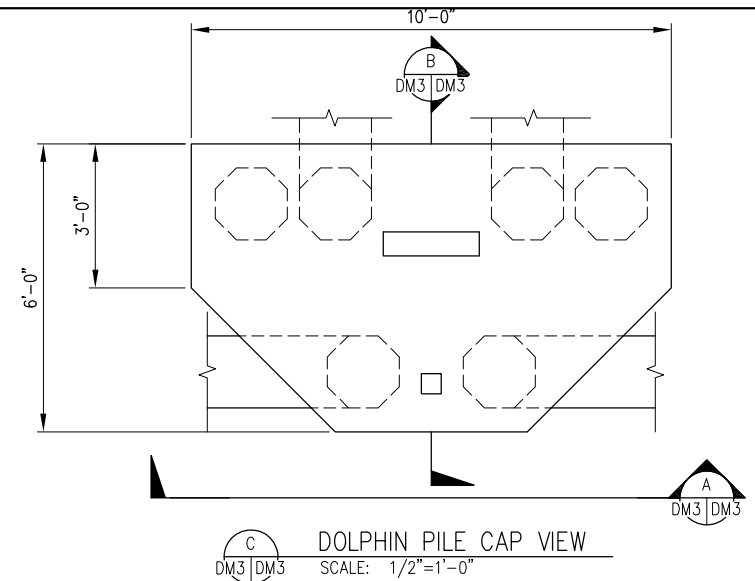


A
DM3 | DM3
TYP. DOLPHIN ELEVATION
SCALE: 1/2"=1'-0"

B
DM3 | DM3
TYP. DOLPHIN SECTION
SCALE: 1/2"=1'-0"



E
DM2 | DM3
TIMBER PLATFORM SECTION (SUBMERGED UNDERWATER)
SCALE: 1/2"=1'-0"



D
DM2, DR3 | DM3
TIMBER ACCESS PIER SECTION (SUBMERGED UNDERWATER)
SCALE: 3/4"=1'-0"

NOTES

- SECTIONS SHOWN FOR REFERENCE ONLY. ALL CONCRETE IS REINFORCED. CONTRACTOR SHALL BE RESPONSIBLE FOR DEMOLITION AND REMOVAL OF ALL EXISTING PILES AND PIER STRUCTURE.
- DEMOLITION ITEM CALLOUTS HEREON ARE REPRESENTATIVE OF WHAT IS TO BE DONE, NOT AN ITEMIZED ACCOUNTING FOR EACH ITEM TO BE DEMOLISHED, REMOVED AND DISPOSED OF.
- HAZARDOUS MATERIALS ARE NOT IDENTIFIED IN THIS PIER 11 DEMOLITION DRAWING. SEE HAZARDOUS MATERIAL ABATEMENT DRAWINGS TO IDENTIFY DEMOLITION ITEMS THAT ARE POTENTIALLY HAZARDOUS AND REQUIRE HANDLING OR ABATEMENT PRIOR TO DEMOLITION.
- ALL UTILITIES ASSOCIATED WITH PIER 11 SHALL BE PERMANENTLY CAPPED AT FACE OF MOLE SLOPE AND/ OR FACE OF SLOPE ABUTMENT
- ALL DEMOLITION SHALL BE COMPLETE PRIOR TO DREDGING IN THE AREA
- ALL MISCELLANEOUS FEEDERS ASSOCIATED WITH PIER 11 SHALL BE TERMINATED AT A LOCATION DETERMINED BY THE ENGINEER.

DEMOLITION KEY NOTES

UNLESS OTHERWISE INDICATED ON THIS PLAN, COMPLETELY DEMOLISH, REMOVE OR DISPOSE OF ALL THE ELEMENTS OF THE PIER STRUCTURE, PILE CAPS AND PILES, INCLUDING UTILITIES.

MARK	DATE	BY	REVISIONS

DRAWN J.H. DATE 1/2008
DESIGNED J.L. P.E. NO. _____
PROJ. MGR. S.C. P.E. NO. _____
SECT. HEAD D.J.S. P.E. NO. C-46837

CHIEF HARBOR ENGINEER P.E. NO. C-25677, DATE _____



THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

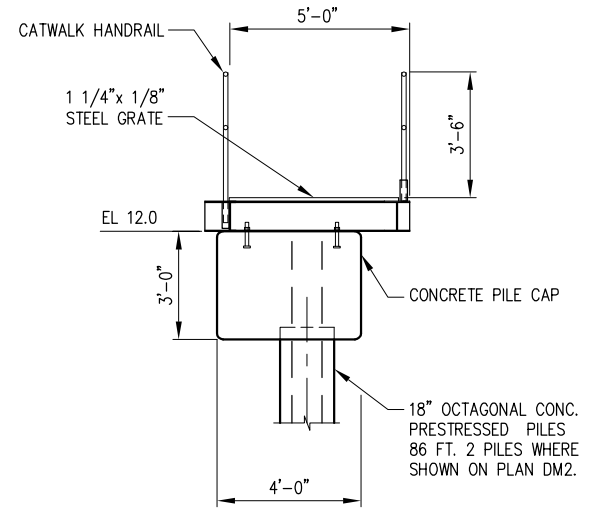
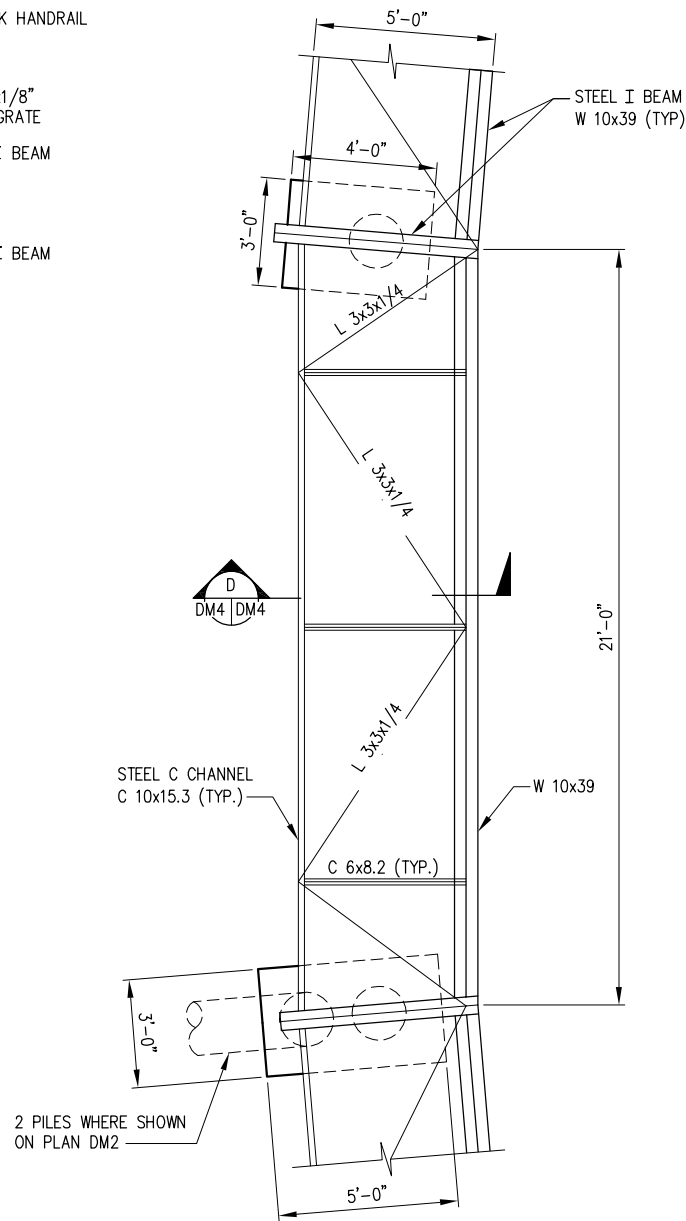
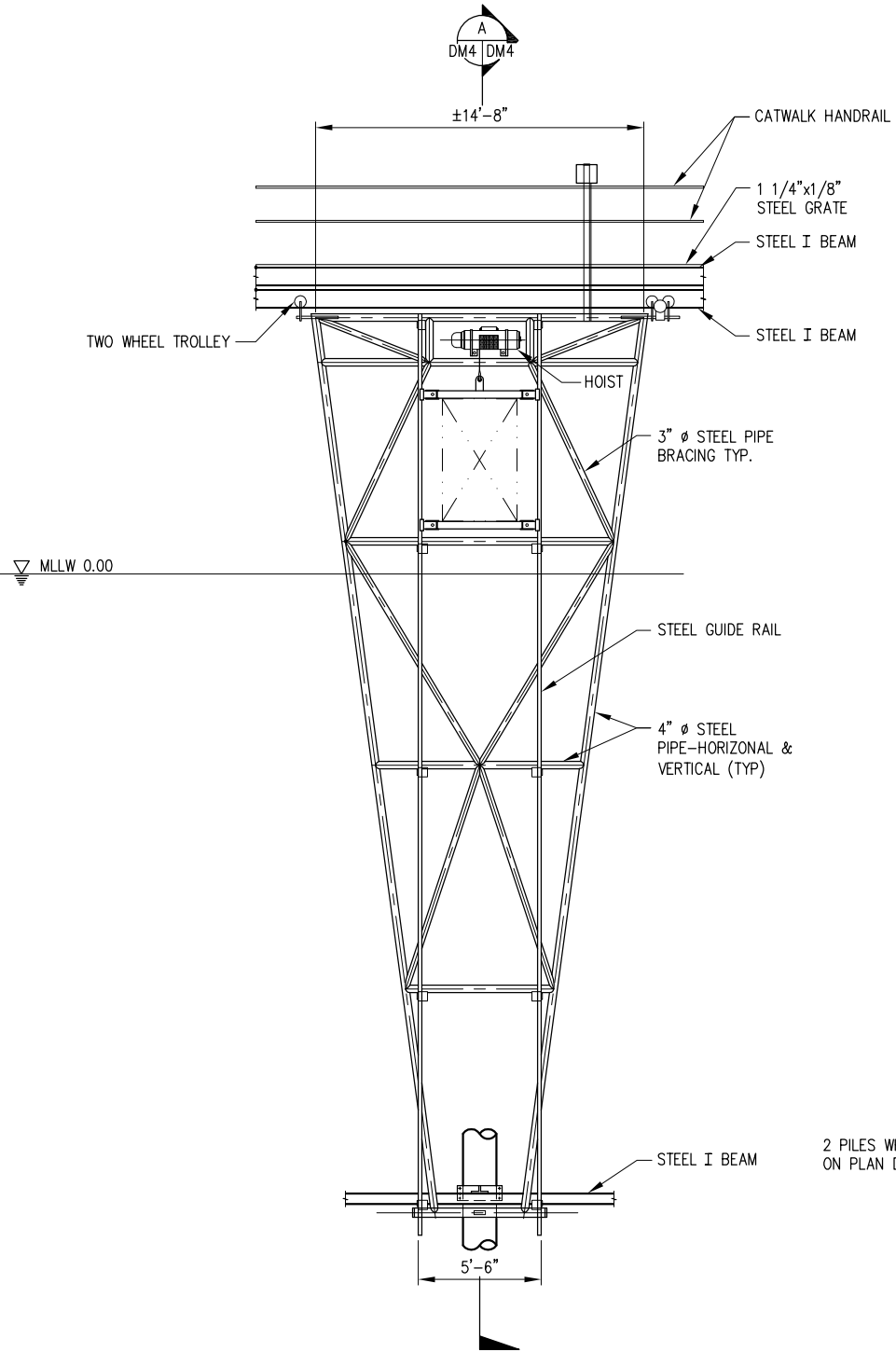
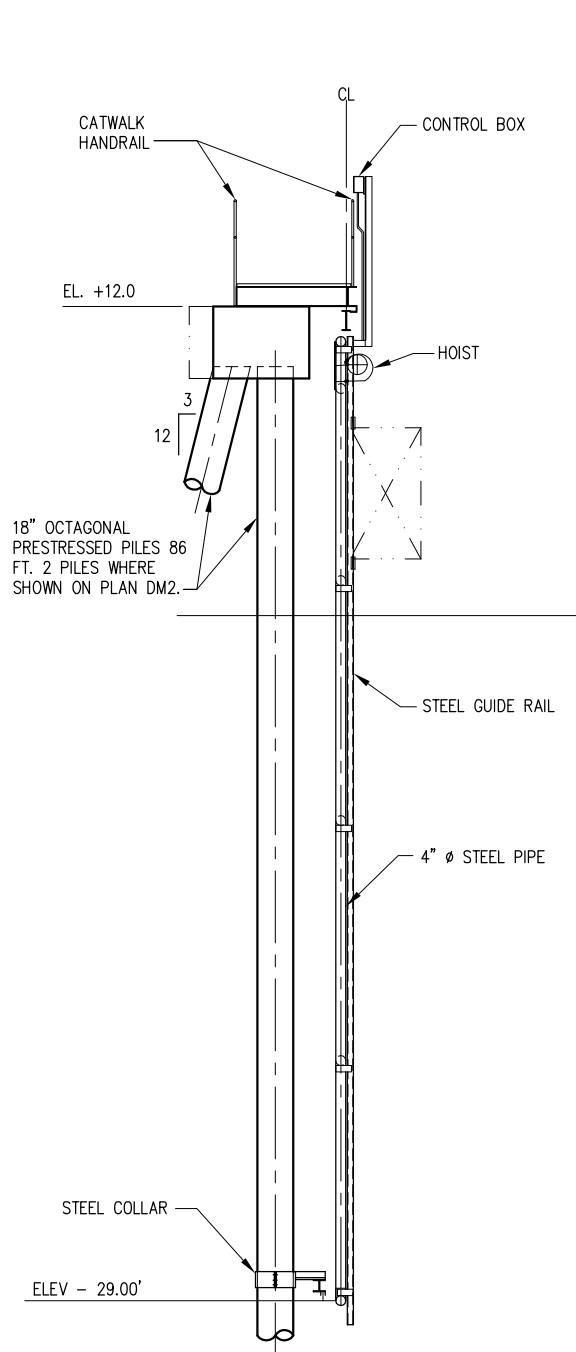
PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
PIER 11 DEMOLITION DETAILS

FN: D1997DM3
k p f f Consulting Engineers
400 Oceanside, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

SCALE
AS SHOWN SHEET 21 OF 28
SPECIFICATION NUMBER HD-S2319
DRAWING NUMBER HD-10-1997-DM3

FINAL SUBMITTAL SET

Plotted: Mar 17, 2009 - 10:46am jollerbach M:\2007\107224 - POLB- West Basin Dredge Drawings\CURRENT\DM4 (DEMOLITION DETAILS).dwg Layout Name: Layout1



NOTES

- SECTIONS SHOWN FOR REFERENCE ONLY. ALL CONCRETE IS REINFORCED. CONTRACTOR SHALL BE RESPONSIBLE FOR DEMOLITION AND REMOVAL OF ALL EXISTING PILES AND PIER STRUCTURE.
- DEMOLITION ITEM CALLOUTS HEREON ARE REPRESENTATIVE OF WHAT IS TO BE DONE, NOT AN ITEMIZED ACCOUNTING FOR EACH ITEM TO BE DEMOLISHED, REMOVED AND DISPOSED OF.
- HAZARDOUS MATERIALS ARE NOT IDENTIFIED IN THIS PIER 11 DEMOLITION DRAWING. SEE HAZARDOUS MATERIAL ABATEMENT DRAWINGS TO IDENTIFY DEMOLITION ITEMS THAT ARE POTENTIALLY HAZARDOUS AND REQUIRE HANDLING OR ABATEMENT PRIOR TO DEMOLITION.
- ALL UTILITIES ASSOCIATED WITH PIER 11 SHALL BE PERMANENTLY CAPPED AT FACE OF MOLE AND/ OR FACE OF ABUTMENT, UNLESS OTHERWISE NOTED.
- ALL DEMOLITION SHALL BE COMPLETE PRIOR TO DREDGING IN THE AREA
- ALL MISCELLANEOUS FEEDERS ASSOCIATED WITH PIER 11 SHALL BE TERMINATED AT A LOCATION DETERMINED BY THE ENGINEER.

DEMOLITION KEY NOTES

UNLESS OTHERWISE INDICATED ON THIS PLAN, COMPLETELY DEMOLISH, REMOVE OR DISPOSE OF ALL THE ELEMENTS OF THE PIER STRUCTURE PILE CAPS AND PILES, INCLUDING UTILITIES.

FINAL SUBMITTAL SET

MARK	DATE	BY	REVISIONS

DRAWN J.H. DATE 3/2009
DESIGNED J.L. P.E. NO. _____
PROJ. MGR. C.A. P.E. NO. C-44141
SECT. HEAD D.J.S. P.E. NO. C-46837

CHIEF HARBOR ENGINEER P.E. NO. C-25677, DATE _____



THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
PIER 11 DEMOLITION DETAILS

FN: D1997DM4
k p f f Consulting Engineers
400 Oceanside, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

SCALE AS SHOWN SHEET 22 OF 28
SPECIFICATION NUMBER HD-S2319
DRAWING NUMBER HD-10-1997-DM4

Plotted: Mar 17, 2009 -- 10:29am jhollerbach M:\2007\107224 - POLB- West Basin Dredge\Drawings\CURRENT\01997-DW5 (DEMOLITION PHOTOS).dwg Layout Name: Layout1

FILL SINK HOLE
WITH ONE
SACK-SLURRY

3'x3'x3' DEEP HOLE,
FILL WITH
COMPACTED CMB OR
ONE SACK-SLURRY



SOUTH ELEVATION
NTS

REMOVE 4" STEEL
CONDUITS

REMOVE STEAM
CABINET

PROTECT FENCE
IN PLACE

INSTALL BLIND
FLANGE



REMOVE PIPE AND
CAP AT SLOPED
ABUTMENT

REMOVE AND CAP
STEAMLINE AT
SLOPED ABUTMENT

EAST ELEVATION
NTS

REMOVE UTILITIES



NORTHEAST ELEVATION
NTS



FLOATING DOCK-AREA AOEC-A
NTS

NOTES

1. SECTIONS SHOWN FOR REFERENCE ONLY. ALL CONCRETE IS REINFORCED. CONTRACTOR SHALL BE RESPONSIBLE FOR DEMOLITION AND REMOVAL OF ALL EXISTING PILES AND PIER STRUCTURE.
2. DEMOLITION ITEM CALLOUTS HEREON ARE REPRESENTATIVE OF WHAT IS TO BE DONE, NOT AN ITEMIZED ACCOUNTING FOR EACH ITEM TO BE DEMOLISHED, REMOVED AND DISPOSED OF.
3. HAZARDOUS MATERIALS ARE NOT IDENTIFIED IN THIS PIER 11 DEMOLITION DRAWING. SEE HAZARDOUS MATERIAL ABATEMENT DRAWINGS TO IDENTIFY DEMOLITION ITEMS THAT ARE POTENTIALLY HAZARDOUS AND REQUIRE HANDLING OR ABATEMENT PRIOR TO DEMOLITION.
4. ALL UTILITIES ASSOCIATED WITH PIER 11 SHALL BE PERMANENTLY CAPPED AT FACE OF MOLE AND/ OR FACE OF ABUTMENT, UNLESS OTHERWISE NOTED.
5. ALL DEMOLITION SHALL BE COMPLETE PRIOR TO DREDGING IN THE AREA
6. ALL MISCELLANEOUS FEEDERS ASSOCIATED WITH PIER 11 SHALL BE TERMINATED AT A LOCATION DETERMINED BY THE ENGINEER.

DEMOLITION KEY NOTES

UNLESS OTHERWISE INDICATED ON THIS PLAN, COMPLETELY DEMOLISH, REMOVE OR DISPOSE OF ALL THE ELEMENTS OF THE PIER STRUCTURE PILE CAPS AND PILES, INCLUDING UTILITIES.

FN: D1997DM5

kpff Consulting
Engineers
400 Oceangate, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200



THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
PIER 11 DEMOLITION PHOTOS

SCALE
AS SHOWN SHEET 23 OF 28
SPECIFICATION
NUMBER HD-S2319
DRAWING
NUMBER HD-10-1997-DW5

MARK	DATE	BY	REVISIONS

DRAWN J.L.H. DATE 3/2009
DESIGNED J.L. P.E. NO.
PROJ. MGR. C.A. P.E. NO. C-44141
SECT. HEAD D.J.S. P.E. NO. C-46837

CHIEF HARBOR ENGINEER P.E. NO. C-25677, DATE

Plotted: Mar 17, 2009 -- 10:31am jhollenbach M:\2007\107224 - POLB- West Basin Dredge\Drawings\CURRENT\01997-DM6 (DEMOLITION PHOTOS).dwg Layout Name: Layout1



SEWER UNDER ACCESS PIER
NTS



UTILITIES UNDER ACCESS PIER (1)
NTS



UTILITIES UNDER ACCESS PIER (2)
NTS

NOTES

1. SECTIONS SHOWN FOR REFERENCE ONLY. ALL CONCRETE IS REINFORCED. CONTRACTOR SHALL BE RESPONSIBLE FOR DEMOLITION AND REMOVAL OF ALL EXISTING PILES AND PIER STRUCTURE.
2. DEMOLITION ITEM CALLOUTS HEREON ARE REPRESENTATIVE OF WHAT IS TO BE DONE, NOT AN ITEMIZED ACCOUNTING FOR EACH ITEM TO BE DEMOLISHED, REMOVED AND DISPOSED OF.
3. HAZARDOUS MATERIALS ARE NOT IDENTIFIED IN THIS PIER 11 DEMOLITION DRAWING. SEE HAZARDOUS MATERIAL ABATEMENT DRAWINGS TO IDENTIFY DEMOLITION ITEMS THAT ARE POTENTIALLY HAZARDOUS AND REQUIRE HANDLING OR ABATEMENT PRIOR TO DEMOLITION.
4. ALL UTILITIES ASSOCIATED WITH PIER 11 SHALL BE PERMANENTLY CAPPED AT FACE OF MOLE AND/ OR FACE OF ABUTMENT, UNLESS OTHERWISE NOTED.
5. ALL DEMOLITION SHALL BE COMPLETE PRIOR TO DREDGING IN THE AREA
6. ALL MISCELLANEOUS FEEDERS ASSOCIATED WITH PIER 11 SHALL BE TERMINATED AT A LOCATION DETERMINED BY THE ENGINEER.

DEMOLITION KEY NOTES

UNLESS OTHERWISE INDICATED ON THIS PLAN, COMPLETELY DEMOLISH, REMOVE OR DISPOSE OF ALL THE ELEMENTS OF THE PIER STRUCTURE PILE CAPS AND PILES, INCLUDING UTILITIES.

FN: D1997DM6

kpff Consulting Engineers
400 Oceangate, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

THE PORT OF LONG BEACH
925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
PIER 11 DEMOLITION PHOTOS

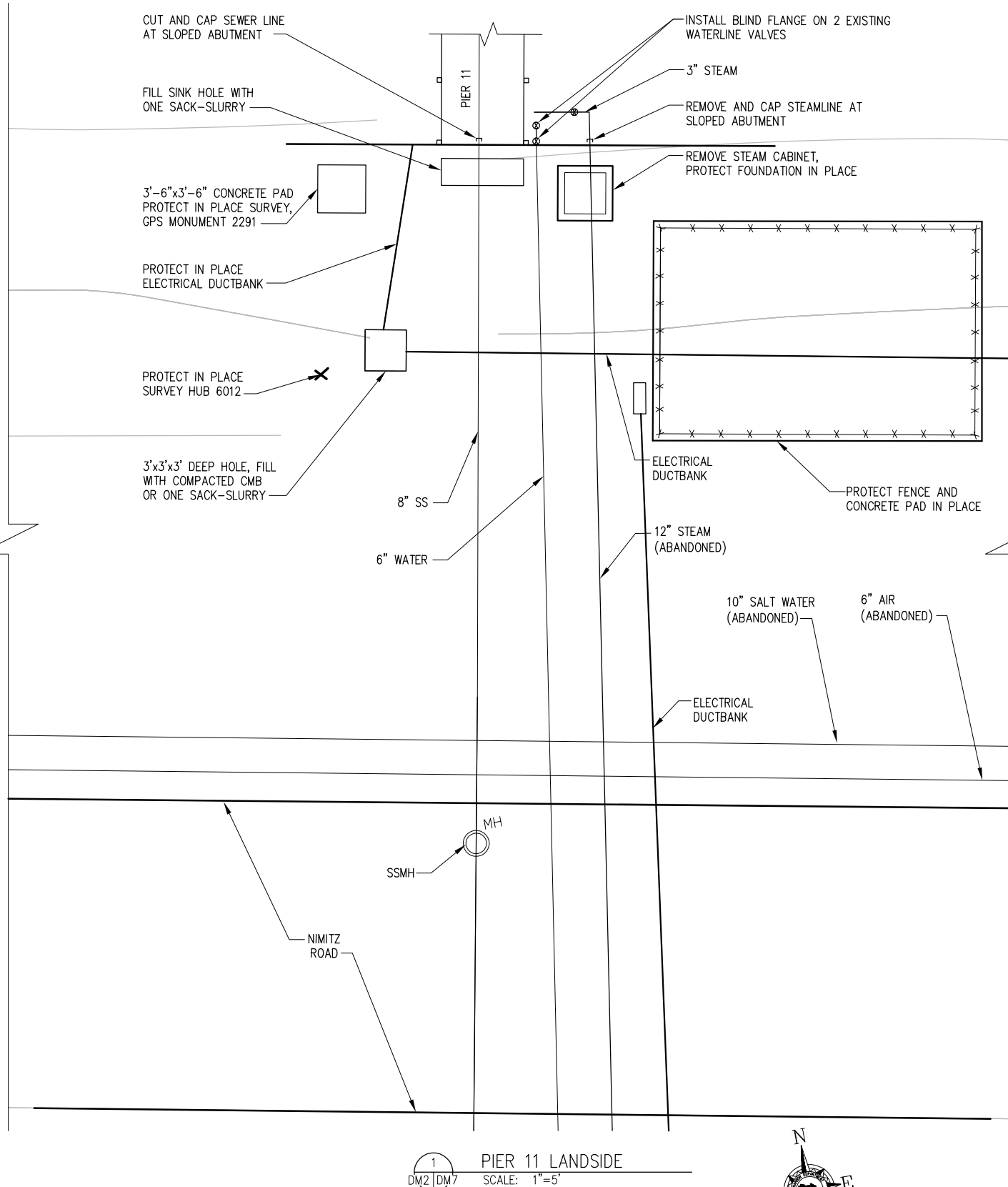
SCALE
AS SHOWN SHEET 24 OF 28
SPECIFICATION NUMBER HD-S2319
DRAWING NUMBER HD-10-1997-DM6

MARK	DATE	BY	REVISIONS

DRAWN J.H. DATE 3/2009
DESIGNED J.L. P.E. NO.
PROJ. MGR. C.A. P.E. NO. C-44141
SECT. HEAD D.J.S. P.E. NO. C-46837

CHIEF HARBOR ENGINEER P.E. NO. C-25677, DATE

Plotted: Mar 17, 2009 - 10:47am jrollerboch M:\2007\107224 - POLB- West Basin Dredge Drawings\CURRENT\01997-DM7 (MOLE LAYDOWN & PIER 11 LANDSIDE PLAN).DWG Layout Name: Layout1



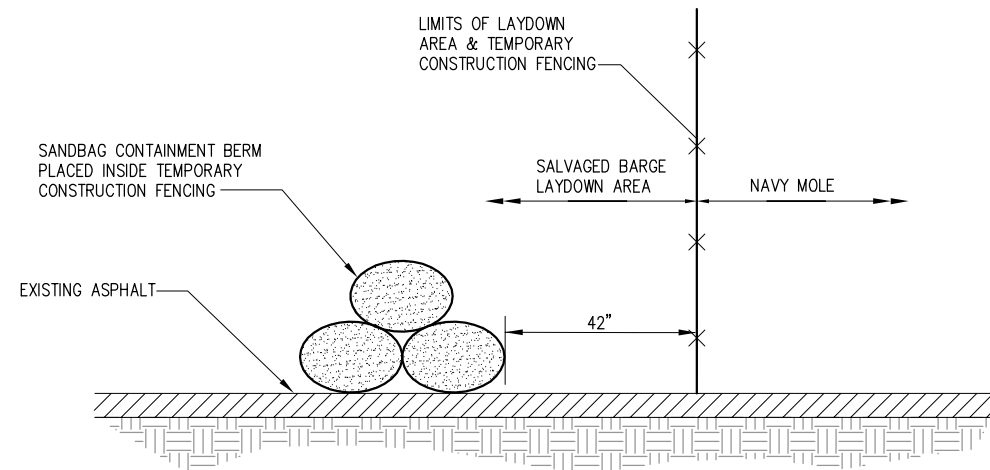
NOTES:

1. CONTRACTOR SHALL PROTECT IN PLACE ALL SURFACE FEATURES AND SUBSURFACE UTILITIES, UNLESS NOTED OTHERWISE.

1
DM2 | DM7
PIER 11 LANDSIDE
SCALE: 1"=5'



0 2.5' 5' 10' 20'
SCALE: 1"=5'



NOTES:

1. TEMPORARY FENCING SHALL ENCOMPASS ENTIRE BARGE LAYDOWN AREA PERIMETER AND SHALL BE CONSTRUCTED PER PORT OF LONG BEACH STANDARD PLANS. A LOCKABLE 4'-0" WIDE WALK GATE SHALL BE PROVIDED.

2
G1 | DM7
CONSTRUCTION FENCING
AND CONTAINMENT BERM
SCALE: N.T.S.

MARK	DATE	BY	REVISIONS

DRAWN J.H. DATE 3/2009
DESIGNED D.B. P.E. NO.
PROJ. MGR. C.A. P.E. NO. C-44141
SECT. HEAD D.J.S. P.E. NO. C-46837

CHIEF HARBOR ENGINEER P.E. NO. C-25677 DATE



THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
PIER 11 LANDSIDE PLAN

FN: 01997DM7
kpff Consulting Engineers
400 Oceangate, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

SCALE
AS SHOWN SHEET 25 OF 28
SPECIFICATION NUMBER HD-S2319
DRAWING NUMBER HD 10-1997-DM7

FINAL SUBMITTAL SET

Plotted: Mar 17, 2009 - 10:52am jhollenbach M:\2007\107224 - POLB- West Basin Dredge Drawings\CURRENT\01997-HD2 (Hazmat Abatement LBP Plan).dwg Layout Name: Layout1

LEAD-BASED PAINT					
SYMBOL	LOCATION	MATERIAL SAMPLED	SUBSTRATE	COLOR	LEAD READING (mg/cm2)
L1	PIER	WATER VALVE BODY	METAL	BLUE	0.8
L2	PIER	WATER VALVE HANDLE	METAL	BLUE	1.0
L3	PIER	WATER VALVE "IN" LINE, 8" DIAMETER	METAL	BLUE	0.7
L4	PIER	WATER VALVE "OUT" LINE, 2" DIAMETER	METAL	BLUE	0.6
L5	PIER	WATER VALVE BODY	METAL	BLACK	0.5
L6	PIER	WATER VALVE HANDLE	METAL	BLACK	0.6
L7	PIER	WATER VALVE "IN" LINE, 10" TO 12" DIAMETER	METAL	BLACK	1.0
L8	PIER	WATER VALVE (FIRE LINE)	METAL	RED	7.2
L9	PIER	ELECTRICAL CONDUIT, 1" DIAMETER	METAL	LIGHT GREEN	ND
L10	PIER	ELECTRICAL CONDUIT, 4" DIAMETER	METAL	LIGHT GREEN	ND
L11	PIER	ELECTRICAL CONDUIT, 4" DIAMETER	METAL	DARK GREEN	ND
L12	PIER	ELECTRICAL CONDUIT, 4" DIAMETER	METAL	GREEN	ND
L13	PIER	2" WATER LINE	METAL	GREEN	0.3
L14	PIER	2" WATER LINE	METAL	GREEN ON ORANGE	0.5
L15	PIER	2" WATER LINE	METAL	GREEN ON ORANGE	0.3
L16	PIER	10" PIPE COATING (STEAM PIPE)	FIBERGLASS	ORANGE	1.1
L17	PIER	10" PIPE COATING (STEAM PIPE)	FIBERGLASS	ORANGE	1.5
L18	BENEATH PIER	WATER LINE, 12" DIAMETER	METAL	BLACK	ND
L19	BENEATH PIER	ELECTRICAL CONDUIT, 4" DIAMETER	METAL	BLUE	ND
L20	BENEATH PIER	ELECTRICAL CONDUIT, 4" DIAMETER	METAL	BLACK	ND
L21	PIER	LIGHT STANDARD (5"x 5")	METAL	BROWN	ND
L22	PIER	LIGHT STANDARD (5"x 5")	METAL	BROWN	ND
L23	PIER	LIGHT STANDARD (5"x 5")	METAL	BROWN	ND
L24	PIER	HAND RAIL - TOP (2"x 6")	WOOD	WHITE	ND
L25	PIER	HAND RAIL - POST (4"x 4")	WOOD	WHITE	ND
L26	PIER	HAND RAIL - SUPPORT (2"x 4")	WOOD	WHITE	ND
L27	PIER	DECK (3"x 11")	WOOD	NO PAINT	ND
L28	PIER	DECK (3"x 11")	WOOD	NO PAINT	ND
L29	PIER	DECK - MAIN SUPPORT (4"x 14")	WOOD	NO PAINT	ND
L30	PIER	DECK - MAIN SUPPORT (4"x 14")	WOOD	NO PAINT	ND
L31	PIER	DECK - MAIN SUPPORT (4"x 14")	WOOD	NO PAINT	ND
L32	PIER	HAND RAIL - TOP (2"x 6")	WOOD	WHITE	ND
L33	PIER	HAND RAIL - POST (4"x 4")	WOOD	WHITE	ND
L34	PIER	HAND RAIL - SUPPORT (2"x 4")	WOOD	WHITE	ND
L35	PIER	HAND RAIL - TOP (2"x 6")	WOOD	WHITE	ND
L36	PIER	HAND RAIL - POST (4"x 4")	WOOD	WHITE	ND
L37	PIER	HAND RAIL - SUPPORT (2"x 4")	WOOD	WHITE	ND

NOTES:

- PAINTED SURFACES ON THE CIRCULAR PORTION OF THE PIER SHOULD BE ASSUMED TO BE LEAD-BASED PAINT, WITH A LEAD READING > 1.0 mg/cm2. REFER TO THE LEAD-BASED PAINT SPECIFICATIONS FOR DETAILED INSTRUCTIONS.
- THE SYMBOLS SHOWN ON THIS DRAWING REPRESENT SAMPLE LOCATIONS ONLY.
- ALL HAZARDOUS MATERIAL SHALL BE ABATED IN COMPLIANCE WITH THE SPECIFICATIONS.

LEGEND:

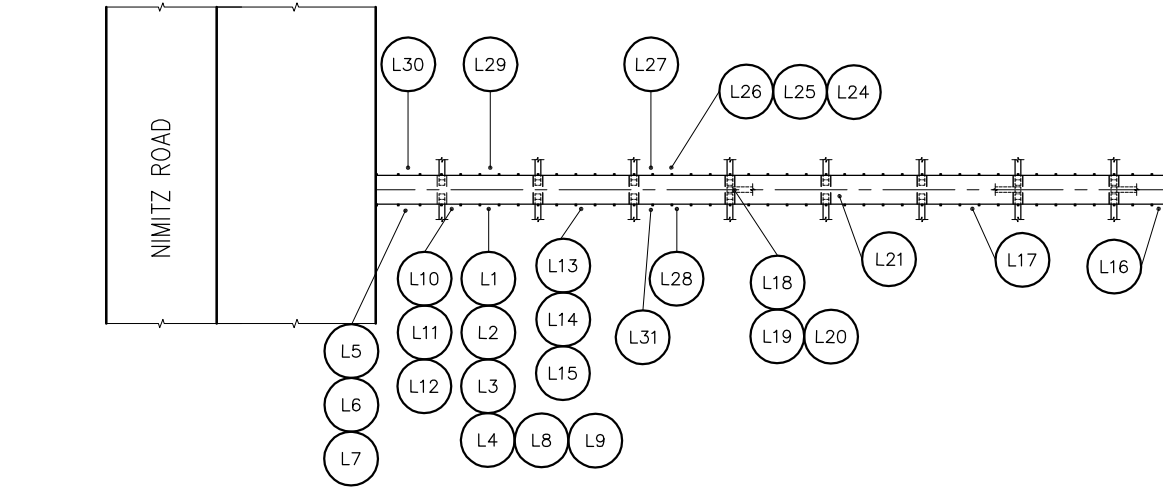
- A#

ASBESTOS SAMPLE LOCATION
- L#

LEAD BASED PAINT SAMPLE LOCATION
- INDICATES SUBMERGED STRUCTURE

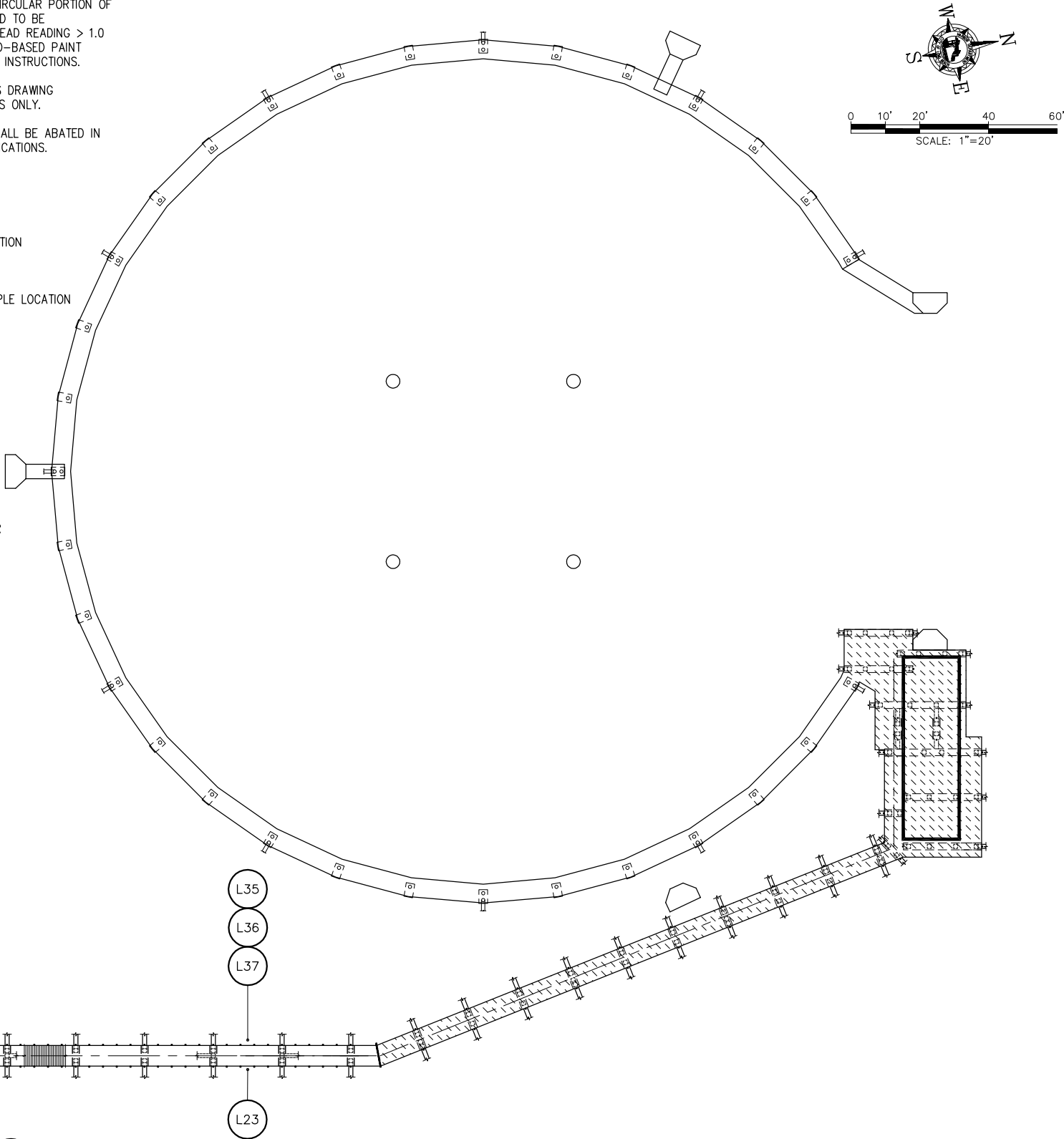
ABBREVIATIONS:

- EA EACH
- NAD NO ASBESTOS DETECTED
- mg/cm2 MILLIGRAMS PER SQUARE CENTIMETER
- ND NOT DETECTED
- A ASBESTOS
- L LEAD
- LBP LEAD BASED PAINT
- N/A NOT APPLICABLE



PIER 11 LBP PLAN

SCALE: 1"=20'



0 10' 20' 40 60'
SCALE: 1"=20'

FINAL SUBMITTAL SET

MARK	DATE	BY	REVISIONS

DRAWN	J.H.	DATE	3/2009
DESIGNED	J.L.	P.E. NO.	
PROJ. MGR.	C.A.	P.E. NO.	44141
SECT. HEAD	D.J.S.	P.E. NO.	46837

CHIEF HARBOR ENGINEER	P.E. NO.	C-25677	DATE	
-----------------------	----------	---------	------	--



925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER T, WEST BASIN
IR SITE 7 SEDIMENT CLEAN-UP
HAZMAT ABATEMENT LBP PLAN, TABLES

SCALE	AS SHOWN	SHEET	27	OF	28
SPECIFICATION NUMBER	HD-S2319				
DRAWING NUMBER	HD-10-1997-HD2				

short logo-blue.jpg Management Services LLC
5000 E. Spring St., Suite 720
Long Beach, California 90815
(562) 740-1067

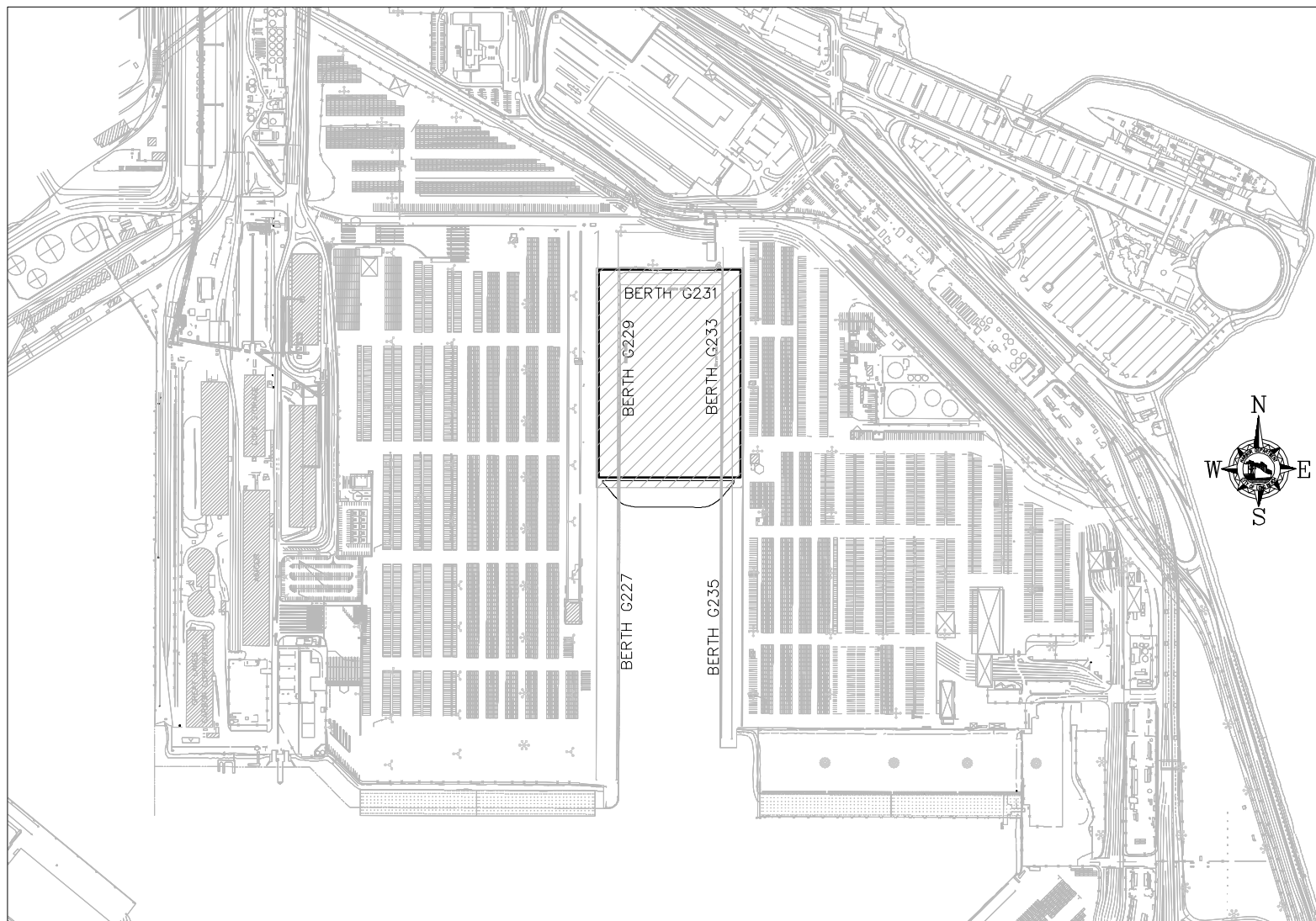
kpff Consulting Engineers
400 Oceangate, Suite 500
Long Beach, California 90802
(562) 437-9100 Fax (562) 437-9200

FN: D1997HD2

APPENDIX B

**DRAFT CONSTRUCTION PLANS FOR THE DEVELOPMENT OF THE
PIER G SLIP FILL SITE
(PROVIDED ON CD)**

PREPARED BY MOFFATT AND NICHOL



FILL SITE PLAN

SCALE: 1" = 400'

CONSTRUCTION NOTES:

1. DREDGE DIKE BASE PREPARATION. SEE DIKE FOUNDATION DREDGE PLAN, DF4, FOR DETAILS.
2. RELOCATE EXISTING ARMOR ROCK SLOPE LOCATED FROM EL. +3' M.L.L.W. AND ABOVE TO BASE OF EXISTING SLOPE. REFER TO DEMOLITION SHEETS FOR DETAILS.
3. CONSTRUCT 3 STAGE ROCK DIKE AND PLACE ARMOR STONE REFER TO SHEET DF11 FOR DETAILS.
4. LAND-FILL WITH DREDGED MATERIAL SEE DFX, DF11, AND DF12 FOR DETAILS.
5. INSTALL SETTLEMENT INSTRUMENT, WICK DRAINS, AND SURCHARGE REFER TO SHTS DF7, DF8, AND DF9 FOR DETAILS.
6. MAINTAIN EXISTING, ADJACENT, BERTHS DEPTHS FOR NAVIGATION AND SAFETY PURPOSES. CONTRACTOR SHALL CONDUCT CLEAN UP AS NECESSARY AND AS DIRECTED BY THE ENGINEER.

DREDGE ELEMENT LEGEND

D101	DREDGE CLOSURE DIKE FOUNDATION
D102	TURNING BASIN AREA A
D103	TURNING BASIN AREA B
D104	IR SITE 7 AOEC-A
D105	IR SITE 7 AOEC-C EAST/WEST
D106	CATALINA LANDING
D107	PIER J BERTHS J266-268
D108	WEST ANCHORAGE BORROW SITE AREA A
D109	WEST ANCHORAGE BORROW SITE AREA B

FILL ELEMENT LEGEND

F101	LIFT 1 WITH FILL MATERIAL FROM DREDGE ELEMENT D102
F102	LIFT 2 WITH FILL MATERIAL FROM DREDGE ELEMENT D101 AND D104
F103	LIFT 3 WITH FILL MATERIAL FROM DREDGE ELEMENT D105
F104	LIFT 4 WITH FILL MATERIAL FROM DREDGE ELEMENT D108
F105	LIFT 5 WITH FILL MATERIAL FROM DREDGE ELEMENT D103 AND D106
F106	LIFT 6 WITH FILL MATERIAL FROM DREDGE ELEMENT D107
F107	LIFT 7 WITH FILL MATERIAL FROM DREDGE ELEMENT D102
F108	LIFT 8 WITH FILL MATERIAL FROM DREDGE ELEMENT D102, D108 AND D109

ROCK ELEMENT LEGEND

R101 LIFT 1 OF THE CONTAINMENT DIKE
R102 LIFT 2 OF THE CONTAINMENT DIKE
R103 ACCESS ROAD SUB BASE LIFT
R104 LIFT 3 OF THE CONTAINMENT DIKE
R105 ARMOR STONE CONTAINMENT DIKE FACE

LEGEND



FILL AREA

GENERAL SAFETY AND FIRE PREVENTION NOTES:

1. THE CONTRACT DRAWINGS AND SPECIFICATIONS REPRESENT A FINISHED STABLE STRUCTURE. STABILITY AND SAFETY OF THE STRUCTURE DURING ALL PHASES OF CONSTRUCTION IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
2. THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN ADEQUACY AND SAFETY OF ERECTION, BRACING, SHORING, TEMPORARY SUPPORTS, ETC. CERTIFIED ERECTION PLANS AS REQUIRED BY APPLICABLE SAFETY REGULATIONS SHALL REMAIN ON SITE ALL TIMES.
3. TEMPORARY LOADING DURING CONSTRUCTION SHALL NOT OVERLOAD DESIGN VALUES. CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING ALL TRADES OF SUCH VALUES PRIOR TO COMMENCEMENT OF WORK. THE CONTRACTOR SHALL PROVIDE MOUNTED VISIBLE SIGNAGE INDICATING THE DESIGN LOADS IN ALL SPACES AS REQUIRED BY APPLICABLE SAFETY REGULATIONS.
4. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE IF A CAL-OSHA PERMIT IS REQUIRED FOR ANY PART OF THE WORK, AND TO OBTAIN SUCH PERMIT SHOULD IT BE REQUIRED.

ABBREVIATIONS

APPROX.	APPROXIMATE
C	CONDUIT, PVC SCH 40 UON
CLR	CLEARANCE
COMM	COMMUNICATION
CONC	CONCRETE
DIA	DIAMETER
DWG	DRAWING
EA	EACH
EL	ELEVATION
ELEC	ELECTRIC
EX, EXIST	EXIST
MAX	MAXIMUM
MH	MANHOLE
MLLW	MEAN LOWER LOW WATER
MIN	MINIMUM
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
PB	PULL BOX
POLB	PORT OF LONG BEACH
PVC	POLYVINYL CHLORIDE CONDUIT
R	RADIUS
REQ'D	REQUIRED
REINF	REINFORCED
SCH	SCHEDULE
STA	STATION
SHT.	SHEET
TEL	TELEPHONE
TPY	TYPICAL
UON	UNLESS OTHERWISE NOTED

100% SUBMITTAL



MOFFATT & NICHOL
1660 HOTEL CIRCLE NORTH
SUITE 200
SAN DIEGO, CA 92108
TEL. (619) 220-6050 FN: DXXXXXX

[illegible]

THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER G, BERTHS G230-G236 TERMINAL REDEVELOPMENT
PIER G NORTH SLIP DREDGE AND FILL PROJECT
SITE PLAN AND GENERAL NOTES

SCALE
AS NOTED

SHEET 2 OF 71

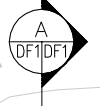
SPECIFICATION
NUMBER HD-S2229

DRAWING
NUMBER HD-10-1821-T2

BERTH J265

BERTH J266

BERTH J267



25

28

26

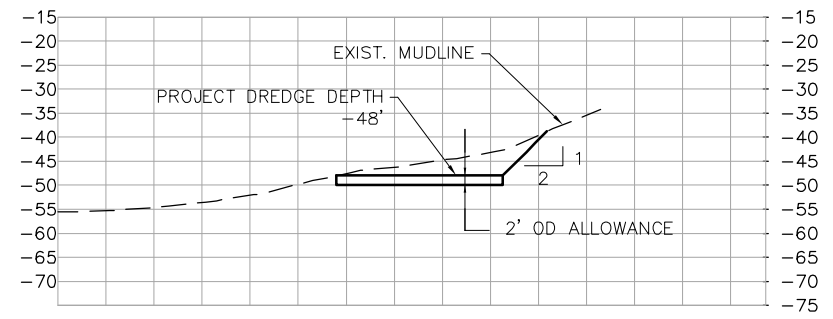
27

PLAN VIEW
SCALE: 1"=50'

LEGEND

- DREDGE AREA
- PROJECT DEPTH ELEV. -48'

POINT TABLE		
POINT #	NORTHING	EASTING
25	1726635.94	6502706.40
26	1726635.94	6503622.27
27	1726577.34	6503622.27
28	1726577.34	6502706.40



SECTION VIEW
SCALE: 1"=20'

100% SUBMITTAL



THE PORT OF LONG BEACH
925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER G, BERTHS G230-G236 TERMINAL REDEVELOPMENT
PIER G NORTH SLIP DREDGE AND FILL PROJECT
PIER J BERTHS 266-268



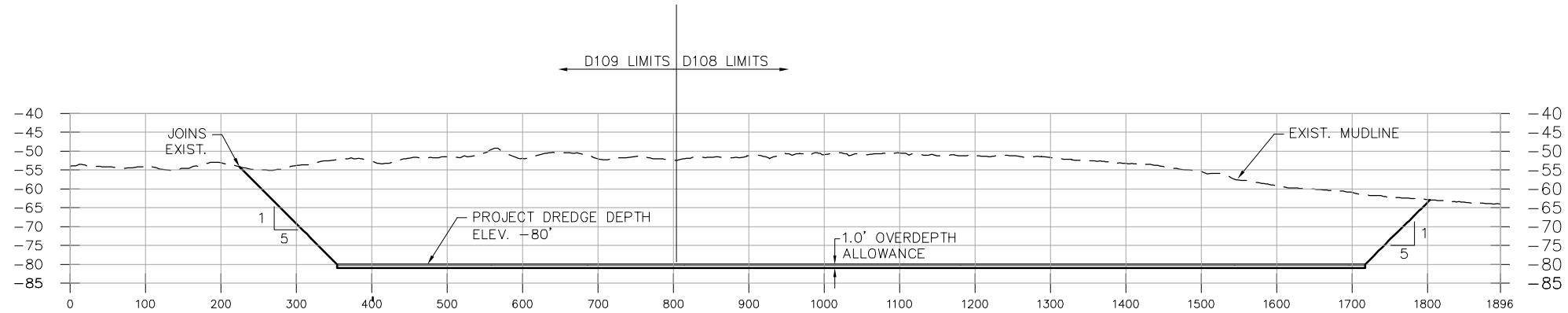
MOFFATT & NICHOL
1660 HOTEL CIRCLE NORTH
SUITE 200
SAN DIEGO, CA 92108
TEL. (619) 220-6050 FAX (619) 220-6050

MARK	DATE	BY	REVISIONS

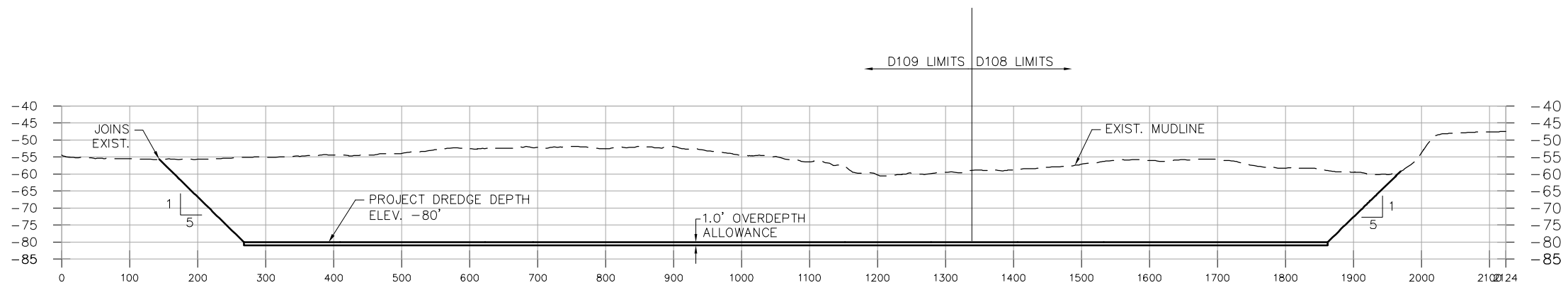
DRAWN DB DATE 12/24/08
DESIGNED AA P.E. NO. C-36045
PROJ. MGR. NCK P.E. NO. C-58055
SECT. HEAD DJS P.E. NO. C-46837

CHIEF HARBOR ENGR. P.E. NO. C-25677 DATE

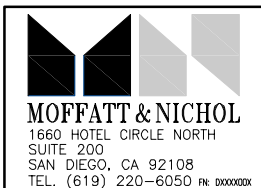
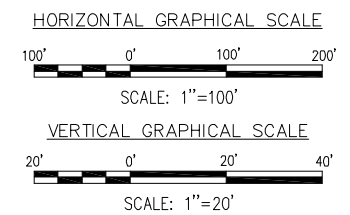
SCALE AS NOTED SHEET 58 OF 71
SPECIFICATION NUMBER HD-S2229
DRAWING NUMBER HD-10-1821-DF1



C SECTION – WEST ANCHORAGE BORROW SITE
DF2 DF3



D SECTION – WEST ANCHORAGE BORROW SITE
DF2 DF3



MARK	DATE	BY	REVISIONS

DRAWN	DB	DATE	03/08
DESIGNED	AA	P.E. NO.	C-36045
PROJ. MGR.	NCK	P.E. NO.	C-58055
SECT. HEAD	DJS	P.E. NO.	C-46837
CHIEF HARBOR ENGR.		P.E. NO.	C-25677
		DATE	





PIER G, BERTHS G230-G236 TERMINAL REDEVELOPMENT
PIER G NORTH SLIP DREDGE AND FILL PROJECT
WEST ANCHORAGE BORROW SITE – SECTIONS


SCALE	AS NOTED	SHEET	60	OF	71
SPECIFICATION NUMBER			HD-S2229		
DRAWING NUMBER			HD-10-1821-DF3		

100% SUBMITTAL

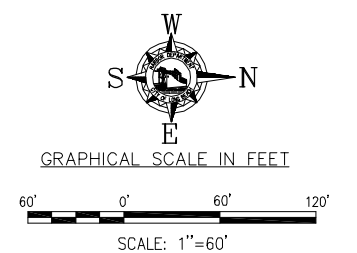
Drawn: DB, Checked: AA, P.E. No. C-36045, Date: 03/08, Project: PIER G, BERTHS G230-G236 TERMINAL REDEVELOPMENT, PIER G NORTH SLIP DREDGE AND FILL PROJECT, WEST ANCHORAGE BORROW SITE – SECTIONS, Scale: 1"=100' (Horizontal), 1"=20' (Vertical), Drawing Number: HD-10-1821-DF3, Sheet: 60 of 71, Specification Number: HD-S2229, Moffatt & Nichol, 1660 Hotel Circle North, Suite 200, San Diego, CA 92108, Tel: (619) 220-6050, Fax: (619) 220-6051

REFER TO SHEET DF8 FOR FILL AND
SCHEDULE ASSIGNMENT.

 FILL ELEVATION
 SLIP FILL LIMITS

FILL CONTROL POINTS		
POINT 	NORTHING	EASTING
30	1730879.14	6501074.88
31	1731919.17	6501074.88
32	1731919.17	6501799.88
33	1730879.14	6501799.88

100% SUBMITTAL



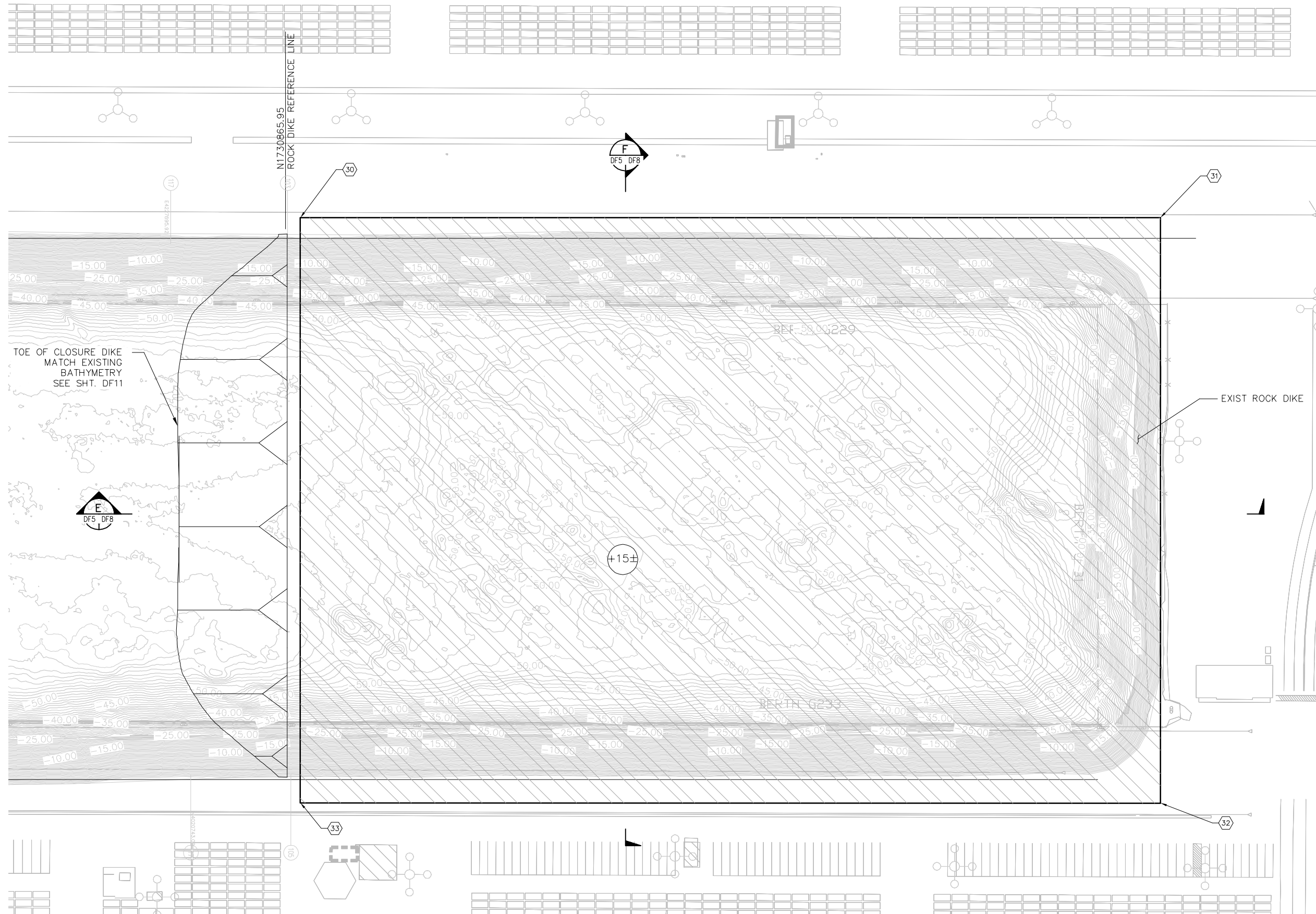
MOFFATT & NICHOL
1660 HOTEL CIRCLE NORTH
SUITE 200
SAN DIEGO, CA 92108
TEL. (619) 220-6050 FN: 0XXXXXX

SCALE
AS NOTED

SHEET 62 OF 71

SPECIFICATION
NUMBER HD-S2229

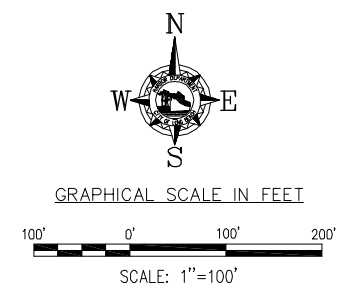
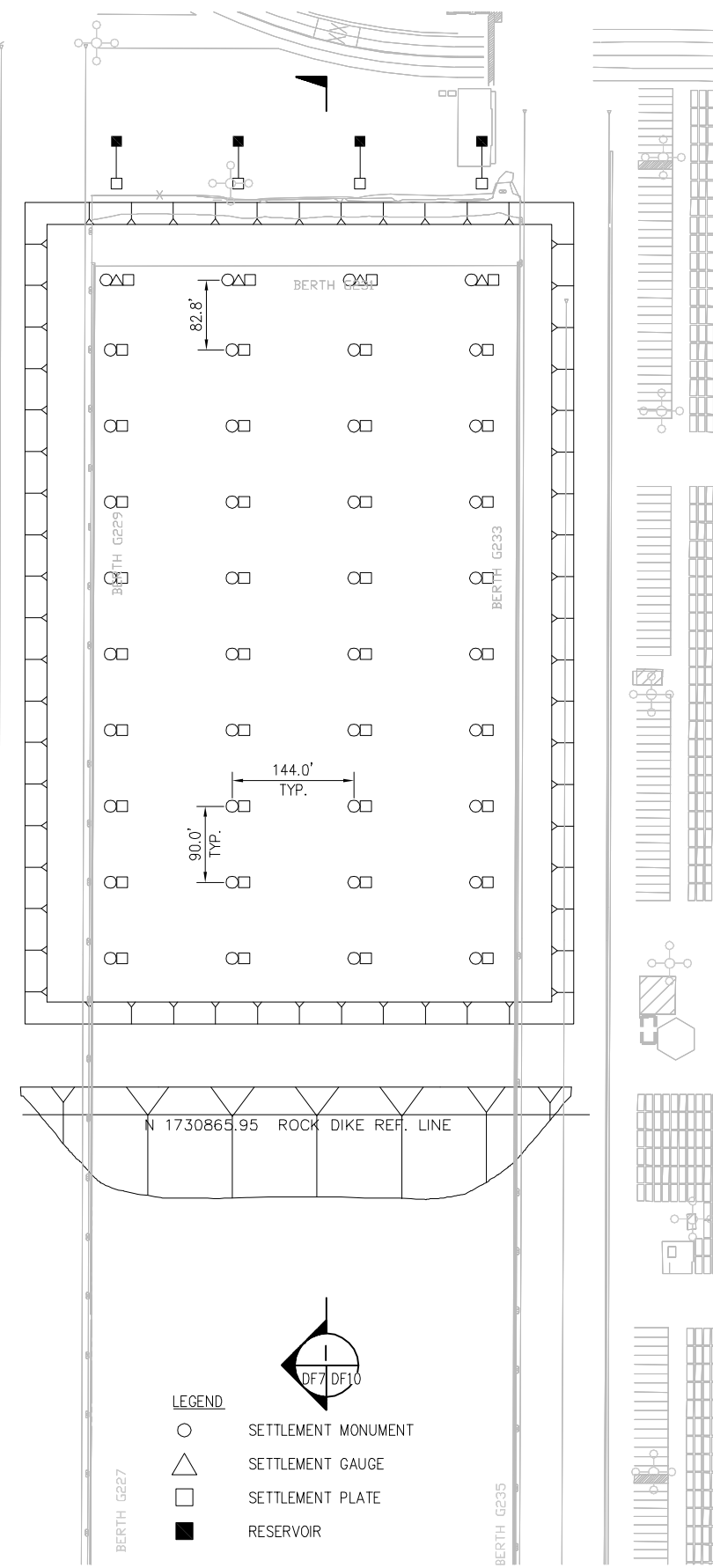
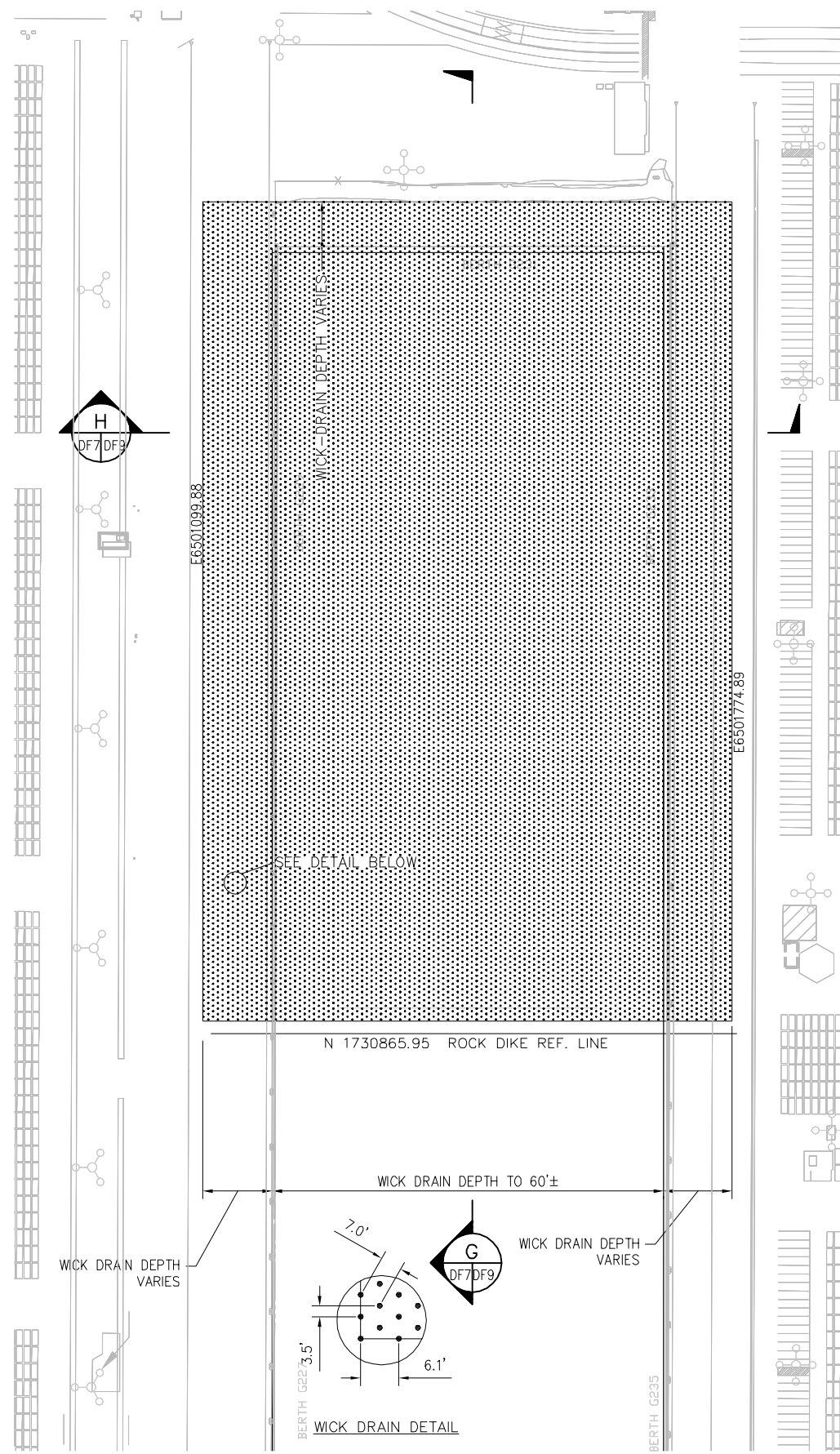
DRAWING
NUMBER HD-10-1821-DF5

[illegible]

THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER G, BERTHS G230-G236 TERMINAL REDEVELOPMENT
PIER G NORTH SLIP DREDGE AND FILL PROJECT
GENERAL FILL PLAN



MOFFATT & NICHOL
1660 HOTEL CIRCLE NORTH
SUITE 200
SAN DIEGO, CA 92108
TEL. (619) 220-6050 FN: 0X0000

[illegible]

THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

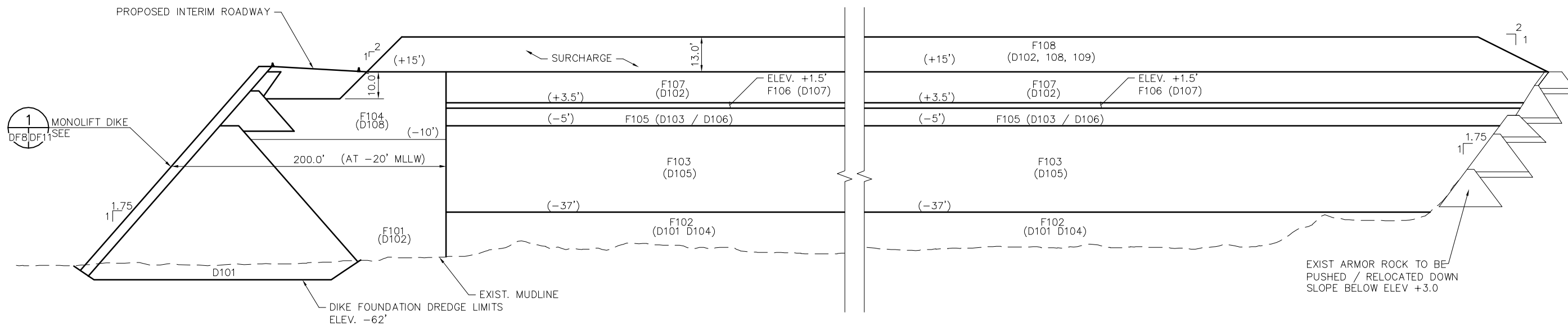
PIER G, BERTHS G230-G236 TERMINAL REDEVELOPMENT
PIER G NORTH SLIP DREDGE AND FILL PROJECT
WICK DRAIN AND SETTLEMENT MONITORING SITE PLAN

SCALE
AS NOTED

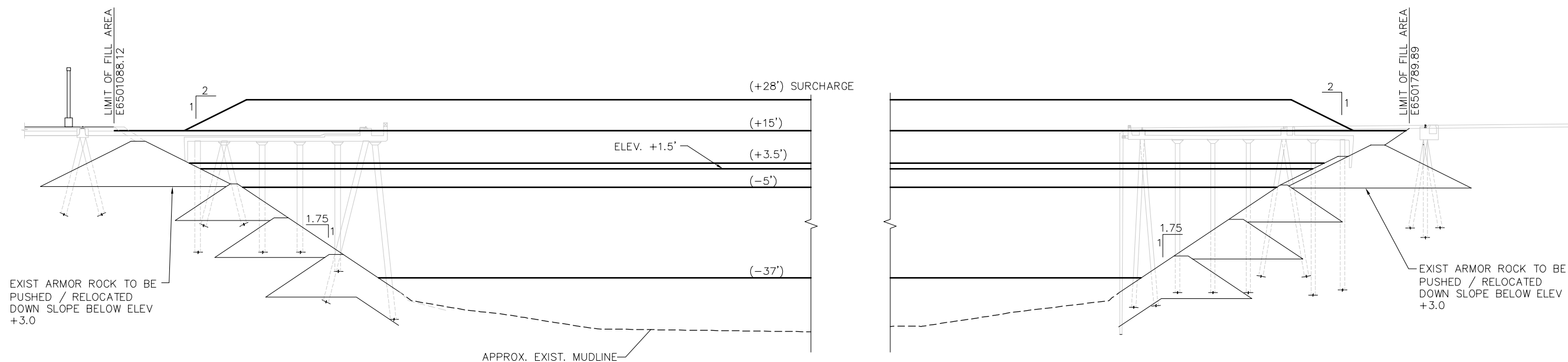
SHEET 64 OF 71

SPECIFICATION
NUMBER HD-S2229

DRAWING
NUMBER HD-10-1821-DF7



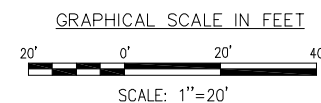
E SECTION
 DF5 DF8 HORIZ: 1" = 40'
 VERT: 1" = 20'



F SECTION
 DF5 DF8 1" = 20'

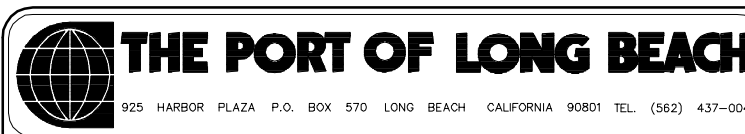
GENERAL NOTES:

1. FILL ELEVATIONS ARE APPROXIMATE



MARK	DATE	BY	REVISIONS

DRAWN	DB	DATE	12/24/08
DESIGNED	AA	P.E. NO.	C-36045
PROJ. MGR.	NCK	P.E. NO.	C-58055
SECT. HEAD	DJS	P.E. NO.	C-46837
CHIEF HARBOR ENGR.		P.E. NO.	C-25677
		DATE	

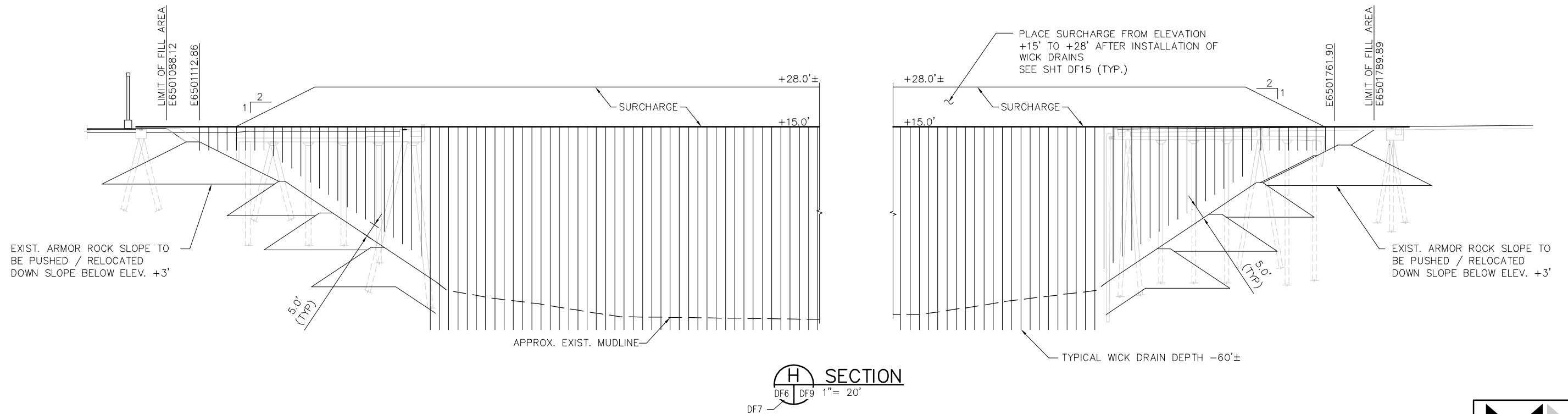
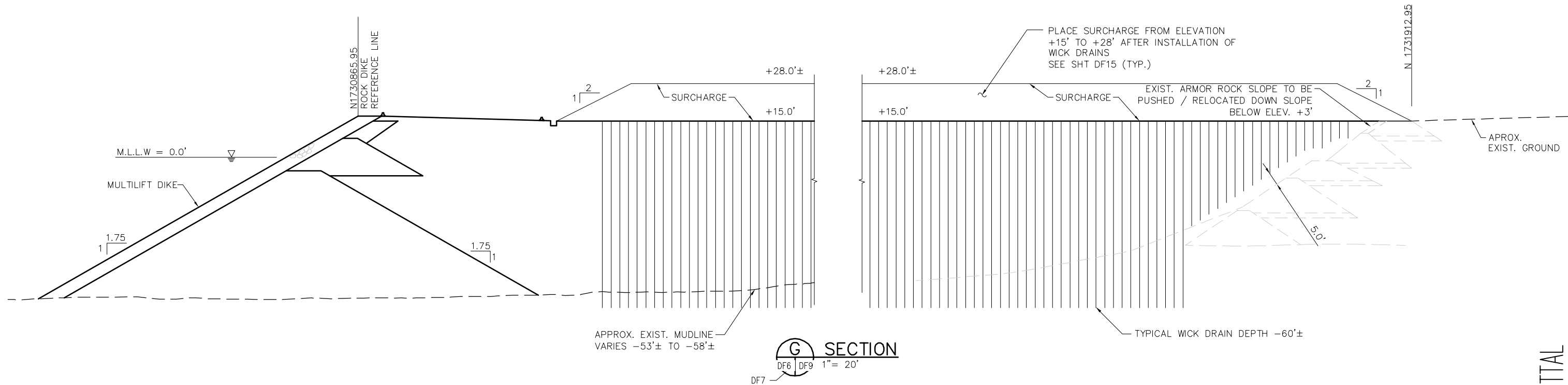


PIER G, BERTHS G230-G236 TERMINAL REDEVELOPMENT
 PIER G NORTH SLIP DREDGE AND FILL PROJECT
 TYPICAL SECTIONS AND FILL SCHEDULE

SCALE	AS NOTED	SHEET	65	OF	71
SPECIFICATION	NUMBER		HD-S2229		
DRAWING	NUMBER		HD-10-1821-DF8		

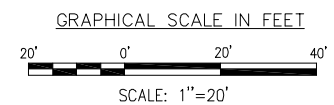
100% SUBMITTAL

Drawn by: [Name] Checked by: [Name] Date: [Date] Project: [Project Name] Sheet: [Sheet Number] of [Total Sheets]



GENERAL NOTES:

REFER TO SHEET DF17 FOR FILL AND SCHEDULE ASSIGNMENT



MARK	DATE	BY	REVISIONS

DRAWN DB	DATE 12/24/08
DESIGNED AA	P.E. NO. C-36045
PROJ. MGR. NCK	P.E. NO. C-58055
SECT. HEAD DJS	P.E. NO. C-46837
CHIEF HARBOR ENGR.	P.E. NO. C-25677
	DATE

THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

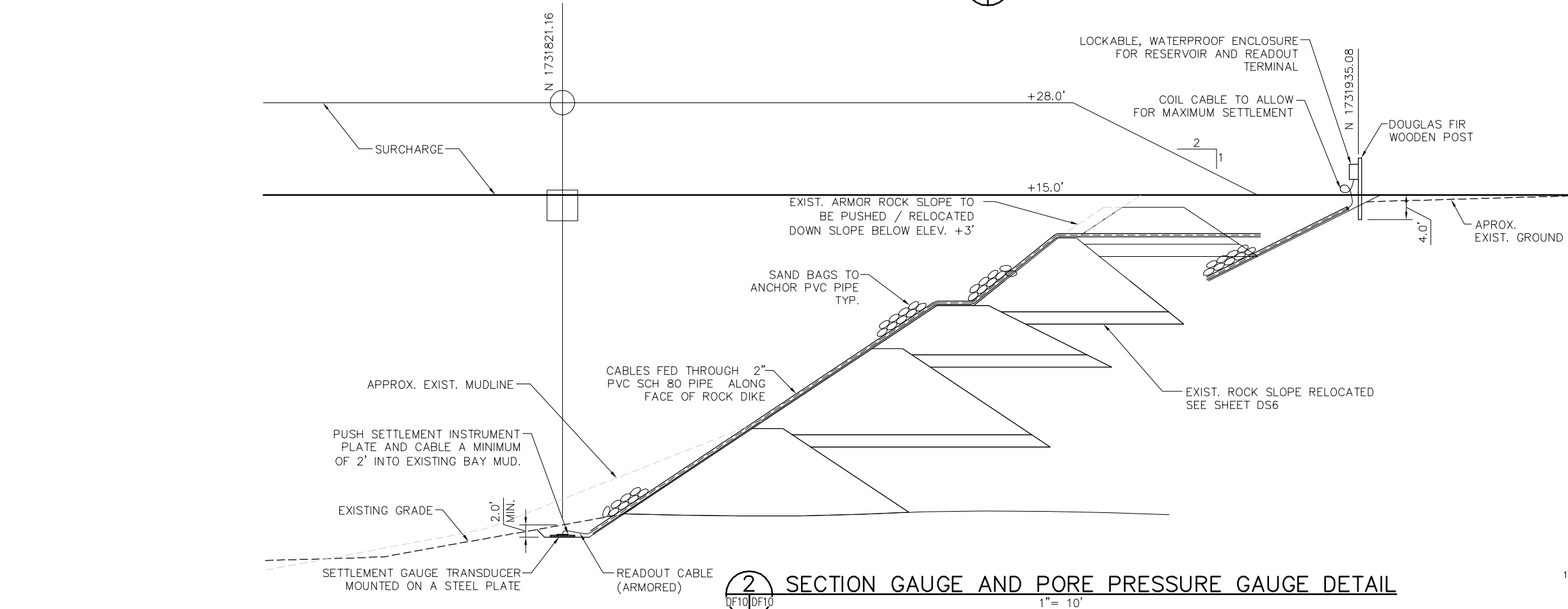
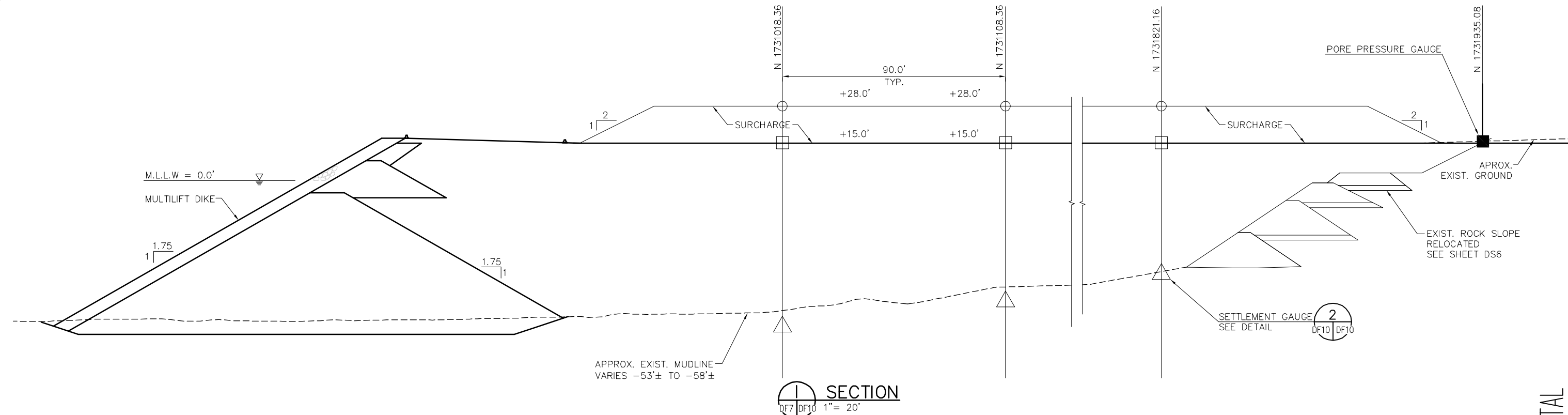
PIER G, BERTHS G230-G236 TERMINAL REDEVELOPMENT
PIER G NORTH SLIP DREDGE AND FILL PROJECT
SURCHARGE AND WICK DRAIN TYPICAL SECTIONS

MOFFATT & NICHOL
1660 HOTEL CIRCLE NORTH
SUITE 200
SAN DIEGO, CA 92108
TEL. (619) 220-6050 FAX 00000000

SCALE AS NOTED SHEET 66 OF 71
SPECIFICATION NUMBER HD-S2229
DRAWING NUMBER HD-10-1821-DF9

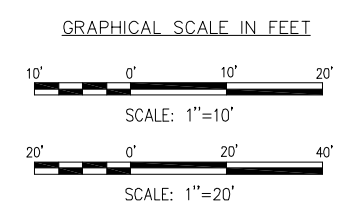
100% SUBMITTAL

2: V:\DATA\Bier 12\Bier12\Drawings\PORT\PIER G\PIER G.dwg 12/24/08 2:00 PM 0.00mm



GENERAL NOTES:
REFER TO SHEET DF17 FOR FILL AND SCHEDULE ASSIGNMENT.

- LEGEND**
- CABLING AND TUBING
 - SETTLEMENT MONUMENT
 - SETTLEMENT GAUGE
 - SETTLEMENT PLATE
 - RESERVOIR



MOFFATT & NICHOL
1660 HOTEL CIRCLE NORTH
SUITE 200
SAN DIEGO, CA 92108
TEL. (619) 220-6050 FAX 00000000

MARK	DATE	BY	REVISIONS

DRAWN	DB	DATE	12/24/08
DESIGNED	AA	P.E. NO.	C-36045
PROJ. MGR.	NCK	P.E. NO.	C-58055
SECT. HEAD	DJS	P.E. NO.	C-46837
CHIEF HARBOR ENGR.		P.E. NO.	C-25677
		DATE	

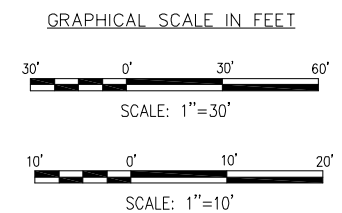
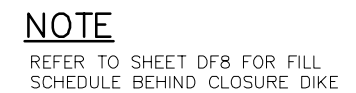
THE PORT OF LONG BEACH
925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER G, BERTHS G230-G236 TERMINAL REDEVELOPMENT
PIER G NORTH SLIP DREDGE AND FILL PROJECT
SETTLEMENT MONITORING SECTION AND DETAILS

SCALE	AS NOTED	SHEET	67	OF	71
SPECIFICATION NUMBER	HD-S2229				
DRAWING NUMBER	HD-10-1821-DF10				

100% SUBMITTAL

Drawn by: DB, Date: 12/24/08, P.E. No.: C-36045, Project Manager: NCK, P.E. No.: C-58055, Section Head: DJS, P.E. No.: C-46837, Chief Harbor Engineer: [blank], P.E. No.: C-25677, Date: [blank], Scale: 1"=20', 1"=10', Sheet: 67 of 71, Specification Number: HD-S2229, Drawing Number: HD-10-1821-DF10, Moffatt & Nichol, 1660 Hotel Circle North, Suite 200, San Diego, CA 92108, Tel: (619) 220-6050, Fax: 00000000



MOFFATT & NICHOL
1660 HOTEL CIRCLE NORTH
SUITE 200
SAN DIEGO, CA 92108
TEL. (619) 220-6050 FN: DXXXXXX

				DRAWN	DB	DATE	12/24/08		
				DESIGNED	AA	P.E. NO.	C-36045		
				PROJ. MGR.	NCK	P.E. NO.	C-58055		
				SECT. HEAD	DJS	P.E. NO.	C-46837		
MARK	DATE	BY							
REVISIONS									
				CHIEF HARBOR ENGR. P.E. NO. C-25677 DATE					



THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER G, BERTHS G230-G236 TERMINAL REDEVELOPMENT
PIER G NORTH SLIP DREDGE AND FILL PROJECT
CLOSURE DIKE PLAN VIEW AND CROSS SECTION

SCALE
AS NOTED

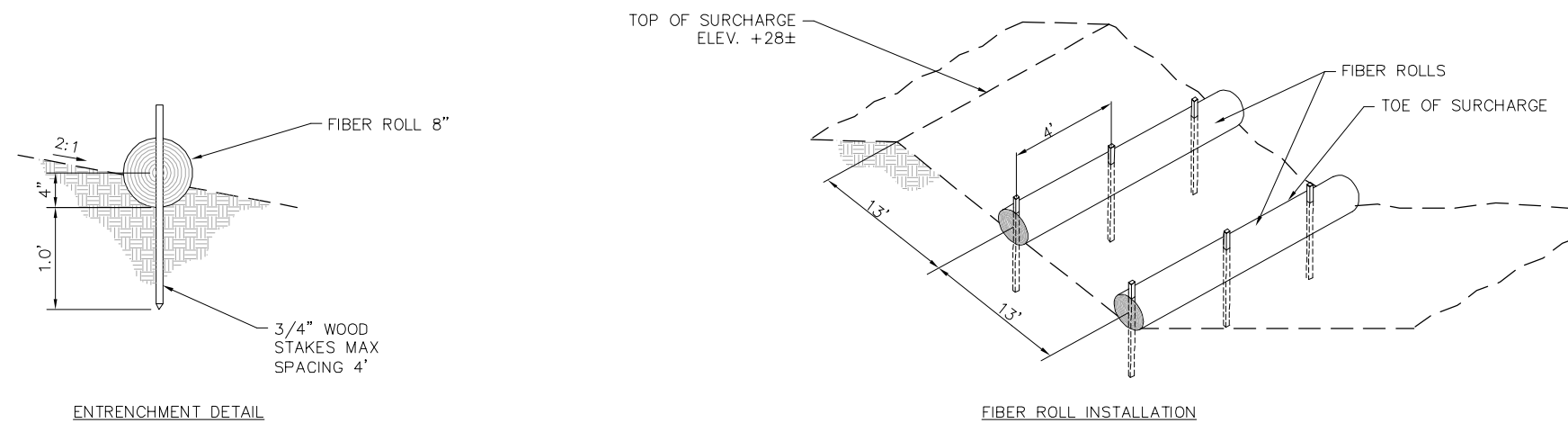
SHEET 68 OF 71

SPECIFICATION
NUMBER HD-S2229

DRAWING
NUMBER HD-10-1821-DF11

D. \ 4815 pier c Monitor Plann \ 4815-02-101 North Cir Fill \ CAN \ dredging fill \ D1821NF11 dwnr. Dec 23 2008 - 0.37nm.

100% SUBMITTAL



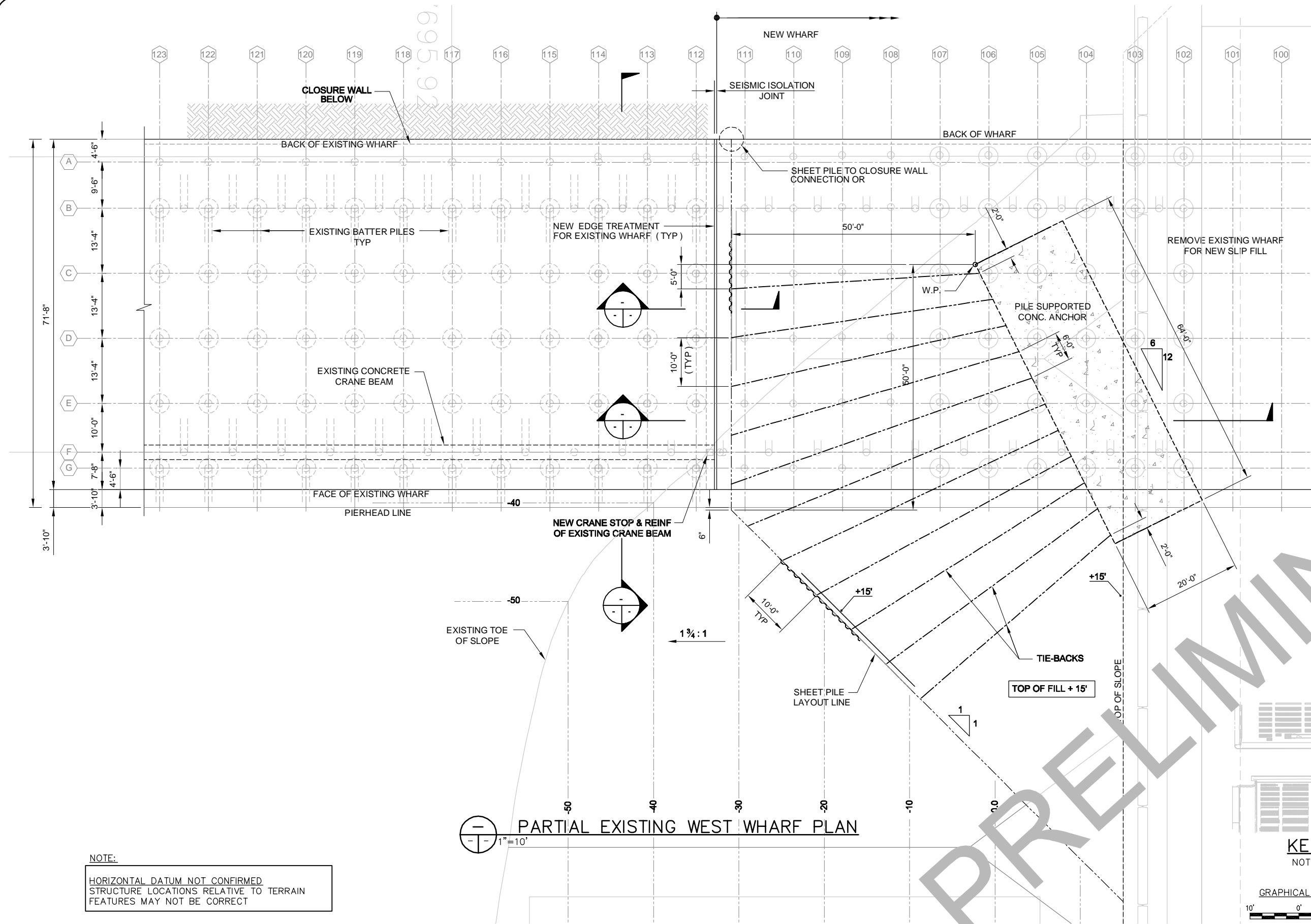
1 DETAIL – FIBER ROLL
DF6 | DF12 NOT TO SCALE

						DRAWN	DB	DATE	12/24/08		
						DESIGNED	AA	P.E. NO.	C-36045		
						PROJ. MGR.	NCK	P.E. NO.	C-58055		
						SECT. HEAD	DJS	P.E. NO.	C-46837		
MARK	DATE	BY				REVISIONS				CHIEF HARBOR ENGR.	P.E. NO. C-25677 DATE



THE PORT OF LONG BEACH
925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

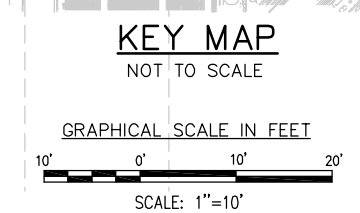
PIER G, BERTHS G230-G236 TERMINAL REDEVELOPMENT
PIER G NORTH SLIP DREDGE AND FILL PROJECT
SURCHARGE AND EROSION CONTROL DETAILS



PARTIAL EXISTING WEST WHARF PLAN

1"=10'

NOTE:
HORIZONTAL DATUM NOT CONFIRMED
STRUCTURE LOCATIONS RELATIVE TO TERRAIN
FEATURES MAY NOT BE CORRECT



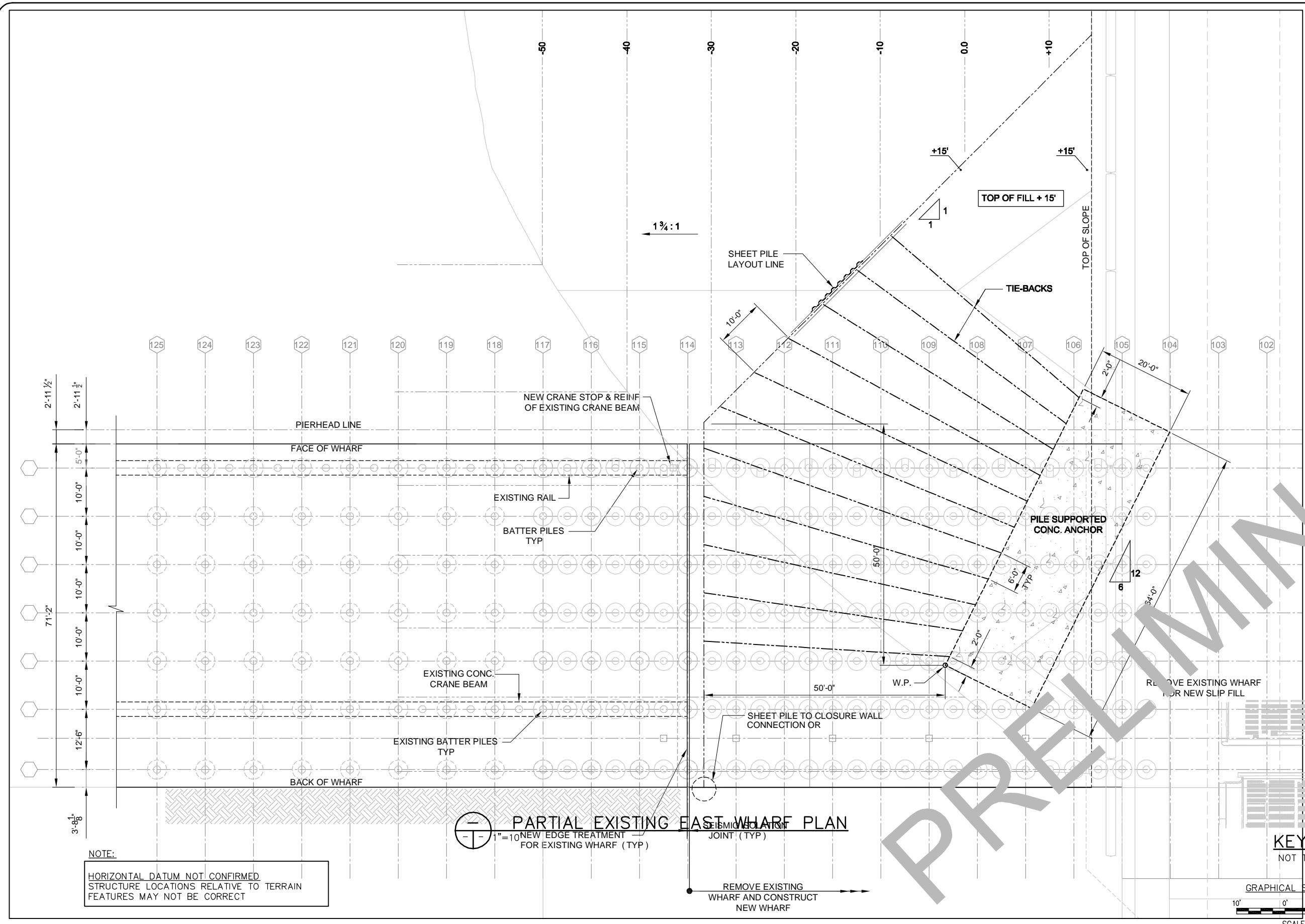
THE PORT OF LONG BEACH

925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER G, BERTHS G230-G236 TERMINAL REDEVELOPMENT
PIER G NORTH SLIP DREDGE AND FILL PROJECT
DEMOLITION TYPICAL SECTIONS - SHEET 2

SCALE	AS NOTED	SHEET	70	OF	71
SPECIFICATION NUMBER	HD-S2229				
DRAWING NUMBER	HD-10-1821-DF13				

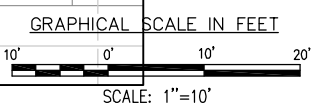
MARK	DATE	BY	REVISIONS	DRAWN	DATE	12/24/08	DESIGNED	AA	P.E. NO.	C-36045	PROJ. MGR.	NCK	P.E. NO.	C-58055	SECT. HEAD	DJS	P.E. NO.	C-46837	CHIEF HARBOR ENGR.	P.E. NO.	C-25677	DATE
------	------	----	-----------	-------	------	----------	----------	----	----------	---------	------------	-----	----------	---------	------------	-----	----------	---------	--------------------	----------	---------	------



PRELIMINARY

100% SUBMITTAL

KEY MAP
NOT TO SCALE



MOFFATT & NICHOL
1660 HOTEL CIRCLE NORTH
SUITE 200
SAN DIEGO, CA 92108
TEL. (619) 220-6050 FAX 00000000

MARK	DATE	BY	REVISIONS

DRAWN	DATE	12/24/08
DESIGNED	AA	P.E. NO. C-36045
PROJ. MGR.	NCK	P.E. NO. C-58055
SECT. HEAD	DJS	P.E. NO. C-46837
CHIEF HARBOR ENGR.	P.E. NO. C-25677	DATE

THE PORT OF LONG BEACH
925 HARBOR PLAZA P.O. BOX 570 LONG BEACH CALIFORNIA 90801 TEL. (562) 437-0041

PIER G, BERTHS G230-G236 TERMINAL REDEVELOPMENT
PIER G NORTH SLIP DREDGE AND FILL PROJECT
DEMOLITION TYPICAL SECTIONS - SHEET 2

SCALE	AS NOTED	SHEET	71	OF	71
SPECIFICATION	NUMBER	HD-S2229			
DRAWING	NUMBER	HD-10-1821-DF14			

APPENDIX C

REVIEW AND DESCRIPTION OF BEST MANAGEMENT PRACTICES

1 DESCRIPTION OF DREDGING AND DISPOSAL BEST MANAGEMENT PRACTICES

BMPs are the actual practices, including the forms, procedures, charts, software references, etc, used by dredgers to minimize the consequences of dredging and disposal on water quality. This section provides an overview of the available dredging BMP technologies, a review of previous investigations regarding their effectiveness, and the presentation of a toolbox for selecting the most appropriate BMPs for use in the Region.

1.1 Review of Available Technologies

Dredging BMPs can be separated into three main categories: silt curtains and gunderbooms, operational controls, and specialty dredging equipment (e.g., environmental buckets). The remainder of this section discusses each of these, along with the advantages and disadvantages for their use.

1.1.1 Silt Curtains and Gunderbooms

The objective when using silt curtains is to create a physical barrier around the dredge equipment to allow the suspended sediments to settle out of the water column in a controlled area. Silt curtains are typically constructed of flexible, reinforced, thermoplastic material with flotation material in the upper hem and ballast material in the lower hem. The curtain is placed in the water surrounding the dredge or disposal area, allowed to unfurl, and then anchored in place using anchor buoys. Silt curtains are most effective on projects where they are not opened and closed to allow equipment access to the dredging or disposal area. Because they are impermeable, silt curtains are easily affected by tides and currents and should not be used in areas with greater than 1-2 knot currents (Hartman Consulting Group 2001). Silt curtains can be deployed so that they extend to within 0.6 meters (2 feet) of the bottom, but this is seldom practical due to water currents. As such, most projects only use curtains that extend a maximum of 3 to 3.6 meters (10 to 12 feet) below the surface. Some of the key advantages of silt curtains are that, if they are deployed correctly, they can protect the adjacent resources and control surface turbidity. The main disadvantages for silt curtains are that they are not effective in high energy environments and they have no effect on bottom turbidity. A gunderboom works in a similar way, except that the curtain is made of a permeable geotextile fabric that allows the water to pass through, but filters out the particulates.

While silt curtains are typically deployed so that they extend downward through part of the water column, gunderbooms are designed to be installed from the water surface to the project bottom. The advantages with gunderbooms are that they allow unlimited curtain depth and permit unrestricted water flow while the disadvantages are that they are more expensive than silt curtains and can become clogged with silt.

1.1.2 Operational Controls

For dredging projects, operational controls are defined as modifications in the operation of the dredging equipment to minimize resuspension of materials. Operational controls can be employed with mechanical dredges, hydraulic dredges, hopper dredges or barges.

Example operational control methods for mechanical dredges include:

- Increasing cycle time – longer cycle time reduces the velocity of the ascending loaded bucket through the water column, which reduces potential to wash sediment from the bucket. However, limiting the velocity of the descending bucket reduces the volume of sediment that is picked up and requires more total bites to remove the project material. The majority of the sediment resuspension, for a clamshell dredge, occurs when the bucket hits the bottom.
- Eliminating multiple bites – when the clamshell bucket hits the bottom, an impact wave of suspended sediment travels along the bottom away from the dredge bucket. When the clamshell bucket takes multiple bites, the bucket loses sediment as it is reopened for subsequent bites. Sediment is also released higher in the water column, as the bucket is raised, opened, and lowered.
- Eliminating bottom stockpiling – bottom stockpiling of the dredged sediment in silty sediment has a similar effect as multiple bite dredging; an increased volume of sediment is released into the water column from the operation.

Example operational controls for hydraulic dredges include:

- Reducing cutterhead rotation speed – reducing cutterhead rotation speed reduces the potential for side casting the excavated sediment away from the suction entrance and resuspending sediment. This measure is typically effective only on maintenance or relatively loose, fine grain sediment.

- Reducing swing speed – reducing the swing speed ensures that the dredge head does not move through the cut faster than it can hydraulically pump the sediment.
- Reducing swing speed reduces the volume of resuspended sediment. The goal is to swing the dredge head at a speed that allows as much of the disturbed sediment as possible to be removed with the hydraulic flow. Typical swing speeds are 1.5 to 9 meters per minute (5 to 30 feet per minute).
- Eliminating the process of bank undercutting – dredgers should remove the sediment in maximum lifts equal to 80 percent or less of the cutterhead diameter.

Example operation controls for hopper dredges and barges include:

- Eliminating or reducing hopper overflow – eliminating or reducing hopper overflow reduces the volume of fine material that flows from the hopper in the overflow. One caution is that this control may significantly reduce project production for hopper dredges or when hydraulic dredging into a barge.
- Lowering the hopper fill level – lowering the hopper fill level in rough sea conditions can prevent material loss during transport.
- Using a recirculation system – water from the hopper overflow can be recirculated to the draghead and used to transport more material into the hopper.

An operation control that can be effective with any type of dredge is to halt dredging during periods of extreme tidal fluctuation when currents are at their strongest point. Another, more generic, operational control is to only work within environmental work windows. Work windows are periods of time when listed species (e.g., California least tern) do not necessarily restrict dredging and disposal activities. Work proposed for times outside these windows requires consultation with the appropriate resource agencies. While this practice in itself will not reduce resuspension, it will reduce the potential for an environmental impact by eliminating the pathway for exposure with a sensitive species.

The main advantages with instituting operational controls are that they do not require installing additional equipment and they can be less costly than installing barriers. The

major disadvantages are that they provide a lower regulatory comfort level because the control measure is not usually visual as with a physical barrier like a silt curtain, and that they typically slow the project down and increase costs.

1.1.3 Specialty Dredging Equipment

The last category of dredging BMPs includes specialty dredging equipment and techniques designed to further reduce impacts from resuspended sediments. Examples include:

- Pneuma Pump - the Pneuma pump is used primarily for removal of fine-grained sediment. The Pneuma pump offers high solids concentration (up to 90 percent) in the dredge slurry, with minimal turbidity. Closed or Environmental Bucket - specially constructed dredging buckets designed to reduce or eliminate increased turbidity of suspended solids from entering a waterway.
- Large Capacity Dredges - larger than normal dredges designed to carry larger loads. This allows less traffic and fewer dumps, thereby providing fewer disturbances at a disposal site.
- Precision Dredging - dredging utilizing special tools and techniques to restrict the material dredged to that specifically identified. This may mean thin layers, either surficial or imbedded, or specific boundaries.

As with the operational controls described above, these specialty equipment options have the potential to reduce sediment resuspension, but also may increase costs.

1.2 Evaluation of Effectiveness of Best Management Practices

For nearly twenty years, the U.S. Army Corps of Engineers has been conducting research to develop techniques for reducing the rate of sediment resuspension during dredging through the development of new equipment and refinement of existing equipment (Raymond 1984). Numerous documents exist (USACE 1986; USACE 1988; Schroeder 2001; Herbich and Brahme 1991; and Hayes 1986) that discuss methods for selecting the proper equipment to reduce sediment resuspension rates depending on site conditions and the resulting effectiveness in the field.

Work conducted by the Corps in Boston Harbor on the effects of different bucket types concluded that “based on turbidity measurements, the conventional bucket produced the highest amount of sediment resuspension spread throughout the water column. Use of the cable arm bucket appeared to reduce sediment resuspension in the water column as the observed depth-averaged turbidity was 46 percent less than observed for the conventional bucket; insufficient total suspended solids (TSS) data were collected during the cable arm bucket operation to completely confirm this reduction, although the few data collected show an even higher reduction. The Enclosed bucket had the lowest overall turbidity and substantially less in the middle of the water column. Observed depth-averaged turbidity for the enclosed bucket was 79 percent less than observed for the conventional bucket. This compared well with observed TSS, which showed depth- averaged TSS concentrations for the enclosed bucket 76 percent less than for the “conventional bucket.” However, if the appropriate type of sediment (e.g., soft) is not present, these reductions may not apply to other sites.

Several researchers (Schroeder 2001; Fort James Corporation et al. 2001; and Averett et al. 1999) have found that the use of silt curtains, when used properly, are effective in reducing off-site transport of resuspended sediment during dredging. Schroeder (2001) evaluated the differences in metal partitioning and losses with and without the use of silt curtains and predicted that dissolved metals concentrations would be less when the silt curtains were used. Other studies have shown that simply controlling resuspended sediments does not equate to reducing contaminant release during dredging. QEA and BBL (2001) found that even though silt curtains were very effective at reducing off-site transport of resuspended sediments, PCB concentrations downstream of the dredge location became elevated during the dredging of hot spots. Similar results were observed with mercury by Alcoa (2000).

These data suggest that dredging BMPs if properly applied and used in appropriate site-specific conditions can be effective at reducing suspended sediments in the water column and controlling losses of contaminants during dredging, but that with some chemicals, elevations in the water column can still occur.

1.3 Toolbox for Selecting Best Management Practices

As presented in Section 5.3.1, there are numerous BMPs available for use under various situations and for controlling various potential environmental impacts. To assist users in the selection of appropriate BMPs for specific situations and for use with specific dredging equipment a BMP selection flow chart and toolbox were created and are presented in Figure 5-2 and Table 5-2.

Using the flow chart in Figure 5-2, a potential dredger or project sponsor would first select the method of dredging to be used (e.g., mechanical or hydraulic) since the available BMPs are specific for each. Next, the user selects the environmental issue of concern, and then answers some simple questions about the site conditions, thus revealing a selection of potential BMPs. There is also a list of key site conditions for each group of BMPs presented that may influence the effectiveness of the method and that should be further investigated.

Once potential BMPs have been identified, the user may then move on to Table 5-2 where each BMP option is described in more detail, including a summary of technical limitations and site constraints, potential advantages and disadvantages, and effective and ineffective applications. The goal for developing these tools is to provide the user sufficient information for proactively identifying potential environmental concerns and recommending BMPs to minimize the impacts.

This is an excerpt from *Los Angeles Regional Contaminated Sediments Task Force: Long-Term Management Strategy*.

APPENDIX D

EXPECTED WATER QUALITY MONITORING REQUIREMENTS

This appendix presents a detailed discussion of a proposed water quality monitoring program and quality assurance program for the Port of Long Beach (Port) West Basin Installation Restoration (IR) Site 7. The program that is presented herein is consistent with typical 401 Water Quality Monitoring Certifications issued by the Regional Water Quality Control Board in this area. This monitoring plan is well suited to projects that involve dredging and disposal of contaminated sediments and has strong and successful precedents in the region.

The objective of this IR Site 7 Water Quality Monitoring Plan and Construction Quality Assurance Plan is to describe the proposed procedures for monitoring water quality parameters at the project site during dredging and disposal operations as well as ensure the construction design documents are properly implemented. This appendix discusses the physical process of mechanically dredging the sediment and placing it into scows for transport to the Pier G Slip Fill site, which is a nearshore Confined Disposal Facility (CDF). Disposal of sediment within the CDF is authorized by the U.S. Army Corps of Engineer's (USACE's) Permit No. 200100395 and Order No. 01-042 (File No. 01-009) from the Los Angeles Regional Water Quality Control Board. These approvals contain numerous permit conditions including requirements for agency notification, implementation of standard dredging and disposal best management practices (BMPs), and general reporting requirements. Therefore, the Port will be required to comply with one or more operational (e.g., BMPs) and/or institutional controls (ICs) to minimize water quality impacts during dredging operations.

1 CONSTRUCTION MONITORING AND POST-DISPOSAL REQUIREMENTS

Nearshore CDFs constructed using contaminated sediments as fill material have been constructed by both ports in San Pedro Bay for many years. This approach has been the standard method for disposing of contaminated dredged material in the Los Angeles Region and is the preferred method by CSTF. Examples of regional CDFs include the Pier 400 construction project and Pier Echo at the Port of Los Angeles (POLA) and the Slip 2 project at the Port. In both instances, dikes were constructed across the entrance to the slip or around the perimeter of the disposal area with open areas to allow vessel traffic. Sediments were then placed into the fill area, initially via bottom-dump scow and then hydraulically as the fill area became too shallow to allow access via scow. As the sediment accumulated in the fill area, the dike walls were increased in height until they broke the surface of the water. Weirs were then used to drain the remaining water from the fill area. After dewatering, the fill areas were



dewatered using surcharge material and wick drains and then covered with asphalt and developed to support various port facilities.

1.1 Pre-dredging Planning

At least 1 week prior to initiation of dredging and disposal operations, a pre-project planning meeting will be held to discuss the schedule and logistics of the planned activities. Specific topics of discussion for the pre-project planning meeting include the following:

- Identify points of contact for all parties involved in the project including emergency contact numbers for the Port, USACE, U.S. Coast Guard (USCG), and local emergency services
- Review the construction specifications and anticipated project schedule
- Review the environmental monitoring requirements for the project, if applicable, and contact numbers for field sampling staff
- Review health and safety requirements and communication between field contractors
- Discuss reporting requirements for the project

1.2 Construction Monitoring

Using the results of the extensive field monitoring conducted for the Contaminated Sediment Task Force (CSTF) Pilot Capping Study as a general example of successful disposal and capping operations, construction monitoring for contaminated sediment dredging and disposal at West Basin IR Site 7 will focus on two main objectives:

- Ensure that significant quantities of contaminated sediments are not deposited outside of the designated CDF facility
- Ensure that chemical releases from the sediment do not occur during dredging and disposal at levels that pose a potential ecological risk to resident aquatic organisms

To achieve these objectives, the following field and laboratory parameters will be monitored during and immediately after construction:

- Field operations will be monitored and documented to ensure proper equipment placement prior to dredging and volumes/depths for all material placed into the CDF facility.

- Water column turbidity monitoring (as an estimate of total suspended solids [TSS]) shall be conducted, as described in Section 5.3.3 of the *Remedial Design and Remedial Action Work Plan*, at reference and downcurrent locations to assess sediment transport during dredging operations.
- Water column samples will be collected, as described in Section 5.3.3 of the *Remedial Design and Remedial Action Work Plan*, and analyzed for dissolved and particulate metals to monitor for chemical release and transport during dredging operations.
- During dredging operations, silt curtains will be used to minimize suspended sediments by isolating the active dredging site from the rest of the Port.

1.2.1 Water Column Monitoring and Observations

Water column monitoring will occur at set distances directly upcurrent and downcurrent from the dredging operations, safety permitting. The proposed upcurrent sampling location will be 100 feet from the silt curtain, and the proposed downcurrent sampling distances for each operation will be 100 and 300 feet from the silt curtain. Samples will also be collected from a control site in an area not affected by dredging operations. The nearest sample will be collected within one hour of the initiation of dredging.

At each monitoring station, measurements for light transmission, dissolved oxygen, and pH will be taken at 6-foot intervals throughout the water column. Measurements for TSS will be conducted at mid-depth. During the first 2 weeks of dredging, sampling will be conducted two times per week and then weekly thereafter.

Water column light transmittance values from 300 feet downstream and at the control station will be compared at 3 feet below the water surface, 3 feet above the bottom, and mid-way between these two points. If the difference in percent light transmittance between these two stations for any of the sampling depths is 30 percent or greater; additional water samples will be collected at mid-depth and will be analyzed for trace metals, DDTs, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs).

Color photographs will also be taken at the time of sampling in order to record the presence and extent of visible effects due to the dredging operations.

Physical observations noting direction and estimated speed of currents; general weather conditions and wind velocity; tidal stage; appearance of trash, floatable material, grease, oil or oily slick, or other objectionable materials; discoloration and/or turbidity; and odors will be made and logged daily during dredging operations.

1.2.2 Construction Operations Monitoring

Proposed monitoring procedures to meet the objectives related to the CDF include:

- Recording tonnage/volume of sediment dredged and placed within the CDF facility
- Tracking location of sediment placement within the CDF facility
- Implementing a Confirmatory Sampling Plan to ensure only “clean” (below SMO criteria) surfaces remain after dredging has been completed
- Tracking operational information such as dredge production rates, downtime, and scow discharge time
- Completing a bathymetric survey of the CDF facility after the sediment has been placed to ensure that the material has been placed properly within the facility

2 CONTINGENCY PLANS

Environmental and maritime safety is of primary importance in IR Site 7 dredging and disposal operation. This plan has been developed with these factors in mind. However, it is recognized that unforeseen events can occur. Sound plans of action are required to assure consistent and appropriate actions are taken to address such events.

2.1 Emergency Notification Procedures

The contractor's field safety plan shall include specific points of contact in the event of emergencies. During the pre-construction meeting, the contractor will be given 24-hour emergency numbers for the Port, USACE, U.S. Environmental Protection Agency (USEPA), USCG, and the Long Beach Police Department.

2.2 Incidents and Unusual Occurrences

The Port, which is responsible for the operation and management of the CDF facility, will work with contractors to establish safe working conditions within and around the CDF facility. At the pre-construction meeting, it will be emphasized that contractors, tugboat captain, and USACE-certified inspector are the first line of defense for ensuring safety and compliance at the site. It will be emphasized that no activities should be started if the potential for problems appears possible, and that any ongoing dredging and disposal activities should be ceased once the potential for problems arises. It is anticipated that most remedies will be precautionary (e.g., waiting for better weather, repairing dredging and disposal equipment, altering dredging and disposal equipment, altering dredging and disposal methods, coordinating conflicting activities among separate users of the Port, etc.).

If incidents and/or unusual occurrences related to environmental protection (such as spills) or maritime safety do occur, the contractor and Port will immediately assess the situation and will make an immediate decision as to whether the specific dredging and disposal activity needs to be temporarily ceased. Remedies will be identified and provided to the Port and, if necessary, the USACE and USCG for their concurrence. The contractor will be required to provide details on how the incident occurred and what immediate steps were taken to limit the extent of the impact. The contractor will be required to report on immediate actions and notifications made. The Port will assess this information and evaluate the proposed remedy of the occurrence.

The engineer will perform environmental monitoring during all specified disposal activities. The results of this monitoring will be reported to the Port and USACE. The Port and USACE will evaluate these results and work together to determine whether operations are environmentally sound. The results of environmental monitoring may require operational methods to be modified to help meet the determined goals.

Any change in dredged material disposal techniques, methods, or equipment must receive prior approval from the Port and USACE. Modifications to environmental permits may be required. If it becomes impractical to meet the criteria, considering the environmental and physical conditions within the site and equipment and methods available to the contractor, then engineering solutions may be considered and proposed. Modifications to the proposed actions and notifications described above will be made as lessons are learned in the operation and management of the site.

APPENDIX E

DEVELOPMENT OF CONFIRMATORY SAMPLING PLAN

The selection of the number of confirmatory samples to be obtained from each dredging area is dependent on several factors including the intent of the sampling, variability in the data or assumed variability, and the level of error that is considered acceptable. These values, particularly the acceptable level of error, are based both on the professional judgment of the designers, local regulatory precedent, and applicable guidance (i.e., Applicable or Relevant and Appropriate Requirements [ARARs]).

For initial design purposes, Anchor Environmental CA, L.P. (Anchor), has developed a generalized Confirmatory Sampling Plan that is cost-effective but still provides a meaningful result with a high degree of confidence that cleanup conditions are properly evaluated. It is based on using an area-weighted average approach in interpreting the results of the confirmatory samples. This same approach has significant precedent for similar high-profile cleanup projects; for example, it has been used and accepted for the Lavaca Bay cleanup project in Texas, the Lower Fox River and Green Bay cleanup sites in Wisconsin, and the Hudson River PCBs Superfund site in New York. As such, this approach is considered highly applicable to the Installation Restoration (IR) Site 7 project as well. All confirmational sampling will occur within 24 to 48 hours after dredging has been completed. This timeframe is needed to allow material sufficient time to settle and ensure that the test results are received with enough time for additional dredging to be performed, if needed, prior to the contractor demobilizing from the site.

1 STATISTICAL PROPERTIES OF EXISTING SEDIMENT DATA

Table E-1 provides a statistical summary of the variability of existing site data for the major chemicals and compounds of interest (i.e., copper, lead, mercury, silver, and zinc). For AOEC-C (West and East), the variability (e.g., standard deviation) is relatively low and the average concentration is significantly lower than the Sediment Management Objectives (SMOs). In area AOEC-A, however, there are several chemicals with relatively high standard deviations and overall averages are closer to (although still below) the SMOs. See, in particular, the values for copper, lead, and zinc, which are more than 50 percent of the SMO values. These data indicate that there is a greater potential for localized “hotspots” in AOEC-A.

Table E-1
Statistical Summary of Existing Site Data

AOEC	Analyte	Maximum Value mg/kg	Average mg/kg	Standard Deviation mg/kg	95 Percent UCL mg/kg	ERL mg/kg	ERM mg/kg	Action Level (SMO)	N ^{ALT}	MDD ^{ALT1}	Average ^{ALT2}	Standard Deviation ^{ALT2}	N ^{ALT2}	MDD ^{ALT2}
AOEC A	Copper	603	117	139	149	34.0	270	254	11	120	–	–	–	–
	Lead	449	51.9	89.0	72.8	46.7	218	100.0	37	40	33	41	6	62
	Mercury	3.04	0.439	0.665	0.595	0.150	0.710	0.900	24	0.40	–	–	–	–
	Silver	1.57	0.306	0.361	0.390	1.00	3.70	3.50	18	3.1	0.263	0.3	2	3.2
	Zinc	1590	201	259	261	150	410	307	85	76	147	118	7	138
AOEC C East	Copper	154	45.8	41.7	55.4	34.0	270	254	2	200	–	–	–	–
	Lead	84.8	17.2	22.0	22.3	46.7	218	100.0	2	80	–	–	–	–
	Mercury	0.881	0.173	0.214	0.222	0.150	0.710	0.900	2	0.70	–	–	–	–
	Silver	0.676	0.217	0.213	0.266	1.00	3.70	3.50	2	3.3	–	–	–	–
	Zinc	257	97.5	67.9	113	150	410	307	3	190	–	–	–	–
AOEC-C West	Copper	267	54.1	51.5	65.6	34.0	270	254	2	190	–	–	–	–
	Lead	148	22.9	28.5	29.3	46.7	218	100.0	3	74	–	–	–	–
	Mercury	1.60	0.273	0.342	0.350	0.150	0.710	0.900	4	0.59	–	–	–	–
	Silver	1.19	0.233	0.257	0.291	1.00	3.70	3.50	2	3.2	–	–	–	–
	Zinc	457	116	79.4	133	150	410	307	3	170	–	–	–	–

Notes:

MDD = Minimum Detectable Difference ('grey region')

ALT1 = alternate sampling strategy 1

ALT2 = alternate sampling strategy 2

UCL = upper confidence limit

ERL = Effects Range-Low

ERM = Effects Range-Median

Sampling Plan Conditions:

ALT1 (sample placement would be randomized or grid)

Ho: Residuals > Action Level (i.e., site is 'dirty')

Ha: Residuals < Action Level

a = 0.05

b = 0.15

MDD = action level - 1.15*average concentration

ALT2 - Same conditions as ALT1 with following modifications:

Four sample outliers removed (A-03 0-1, A-03 1-2, A-03 2-1, and A-07 1-2) for lead, zinc, and silver

Average and standard deviation recalculated for lead, zinc, and silver with outliers excluded

MDD recalculated using updated average values for lead, zinc, and silver



2 ANALYSIS OF SEDIMENT STATISTICS

The information presented in Table E-1 was evaluated with the objective of determining if the average concentrations of sediment remaining after dredging would be likely to exceed the SMO for copper, lead, mercury, silver, zinc, polycyclic aromatic hydrocarbon (PAH), polychlorinated biphenyl (PCB), and dichlorodiphenyltrichloroethane (DDT). The following assumptions and analytical strategies were applied to this evaluation:

- Assume samples will taken within the lateral footprint of the dredging area
- Use a randomized or grid design to collect sufficient number of samples to characterize residuals and meet the objective described above:
- Assume that the data will fit a normal distribution (or close to it)
- Hypothesis to be tested:
 - Ho (null): Average [Residuals] less than SMO
 - Ha (alternative): Average [Residuals] greater than SMO
 - This hypothesis assumes the site is “dirty” and it needs to be proven that it is not. (The data seem to indicate it is not based on the historical data, but agencies typically require this assumption to be conservative)

Furthermore, the following assumptions were made when interpreting the statistical results (i.e., the Decision Error Assumptions):

- Alpha = 0.05. This means that there is a 5 percent probability rejecting a true null hypothesis, falsely rejecting the assumption that the site is “dirty,” Type I error,
- Beta = 0.15. This means there is a 15 percent probability of accepting a false null hypothesis, falsely accepting the assumption that the site is “dirty” when it is really clean, Type II error.
- Minimum Detectable Difference = $SMO - 1.15 \times \text{Average Historical Concentration}$. This means that if the ‘true’ average of the site between the average historical concentration (plus 15 percent) and the SMO, it would be “too close to call” and the data may not be sufficient to correctly identify the Site as clean.
 - All the above values are professional judgment and are related to the data quality objectives of the sampling
- Assumes that the statistical variation in sediment remaining after dredging (including residuals) is equivalent to the variation of available samples (Figure E-1).

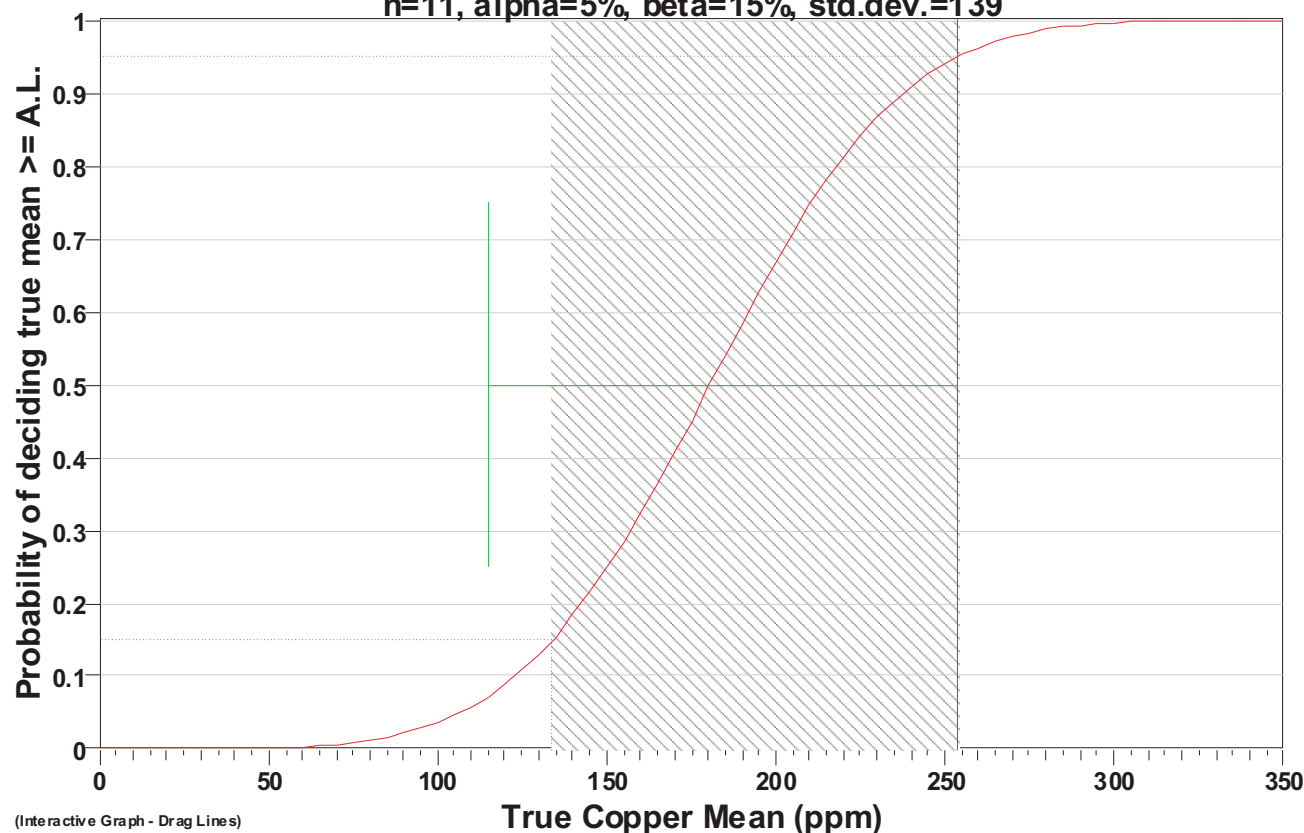


Figure E-1 is graphical representation of how this statistical analysis was conducted. In this example, copper concentrations from AOEC-A are evaluated.



1-Sample t-Test of True Mean vs. Action Level

n=11, alpha=5%, beta=15%, std.dev.=139



Notes:

1. The SMO for copper (254 mg/kg) is vertical red line.
2. Green Error Bar is the standard deviation for copper concentrations in AOEC-A (139 mg/kg)
3. Shaded error is the MDD (Action Level $-1.15 \times \text{Avg} = 120$; in this case from 134 to 254)
 - a. Thus if the true average is between 134 and 254 ppm, there is a unknown or 'too close to call' chance that we would say the site average exceeds the SMO of 254
4. Lower blue dotted line is beta, below this line (134 ppm) there is a 20% chance we would incorrectly conclude the site average exceeds the SMO of 254
5. Upper blue dotted line is alpha, there is a 10% probability that we would conclude the site average is less than the SMO of 254 ppm when in fact it is not.

3 SUMMARY OF CONCLUSIONS REGARDING FREQUENCY OF CONFIRMATORY SAMPLES

For AOEC-C East and West, the number of confirmatory samples indicated by the statistical analysis is relatively low ($N = 2-4$). In order to increase the level of statistical confidence in the results, the number of confirmatory samples in this area will be increased to four for all analytes.

For AOEC-A, the concentrations of zinc and lead and their relatively high standard deviations imply needing a high number of confirmatory samples (up to 85), which is not practical in the field. The individual sample points in AOEC-A were studied further in an attempt to identify possible chemical “hotspots” that could be treated independently of the rest of the dredging area.

A review of the existing data indicates that some outliers exist in the data set used to estimate the variability and average concentrations of lead and zinc in this area of the site. In particular, a statistical outlier analysis using ProUCL software (which applies the Dixon’s Test) identified four potential outliers for lead and zinc, at sample locations A-03 0-1, A-03 1-2, A-03 2-3, and A-07 1-2. These sample locations also included two outliers identified for silver, A-03 1-2 and A-07 1-2. These outliers were judged to be areas warranting individual attention during the confirmatory sampling program.

For the rest of AOEC-A, the outlier samples were subtracted from the existing data set and the average and standard deviation were recalculated. Using these values, the power analysis and sampling design was rerun. Decreases in both the average and variability (i.e., standard deviation) resulted in significantly fewer samples being potentially necessary to achieve the confirmatory sampling objectives (see alternative sampling design No. 2 in Table E-1).

Based on this analysis, the following is recommended for AOEC-A:

- Confirmatory sampling should include 24 randomly or grid based samples to provide adequate power to address the sampling objectives for all metals and organics
- Two additional samples should be taken specifically at sample locations A-03 and A-07 to confirm that elevated levels of zinc, lead, and silver at these locations have been removed

Because the organics were all non-detected and therefore well below the SMO, developing the sampling design based on metals concentrations will also be adequate for the organic compounds.



APPENDIX F

RESPONSE TO COMMENTS



Linda S. Adams
Secretary for
Environmental Protection



Department of Toxic Substances Control

Maureen F. Gorsen, Director
5796 Corporate Avenue
Cypress, California 90630



Arnold Schwarzenegger
Governor

February 27, 2009

Mr. Richard Cameron
Director of Environmental Planning
The Port of Long Beach
925 Harbor Plaza
Long Beach, California 90802

RESPONSE TO COMMENTS ON REMEDIAL DESIGN AND REMEDIAL ACTION WORK PLAN, IR SITES 7, DREDGING PROJECT, PORT OF LONG BEACH, LONG BEACH, CALIFORNIA

Dear Mr. Cameron:

The Department of Toxic Substances Control (DTSC) has received the Port of Long Beach's (POLB) responses to DTSC's comments (RTCs) through an e-mail dated January 29, 2009 on *Remedial Design and Remedial Action Work Plan, IR Site 7 Dredging Project, Port of Long Beach, Long Beach, California*.

Based on the RTCs received and as indicated in the correspondence from the POLB, DTSC will concur with the RTCs, providing the following comments will be integrated in the revised work plan:

1. RTC for DTSC's General Comment Item 3 – The revised language as indicated in RTC will reference the Pier G Slip Fill area in the revised document.
2. RTC for DTSC's Specific Comment Item 1 – To eliminate further confusion between "aerial" and "areal", the revised text on the second sentence of Page 3, Section 1.2 bullet one will be edited as "It comprises approximately 15 acres and was found to contain elevated concentrations of chemical compounds in surface sediments."
3. RTC for DTSC's Specific Comment Item 2 – As indicated at the end of RTC, "the Port acknowledges the need for ICs to govern future uses of the Pier G slip fill site, post construction, to minimize the potential for future disturbances.", DTSC's concern is not about the use of "on-site" or "off-site". Instead, as other covenants are in place at the POLB, DTSC suggests the POLB to include in the revised

Mr. Richard Cameron
February 27, 2009
Page 2

document that DTSC's Covenant will be placed on the location to ensure that the contamination will not be disturbed and that certain uses are restricted.

4. Since several RTCs are related to the actual implementation (e.g. contracting issue) and may not be reflected in the revised document, DTSC requests the RTCs to be included as a part of the final document.

Please incorporate and/or address these DTSC's comments in the final work plan. DTSC looks forward to working with POLB to implement the remedial action plan at IR Site 7. If you have any questions, please contact me at (714) 484-5395.

Sincerely,



Alan Hsu
Remedial Project Manager
Brownfields and Environmental Restoration Program

cc: Ms. Christine Houston
The Port of Long Beach
925 Harbor Plaza
Long Beach, California 90802

Mr. John Hill
Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108

Ms. Angela Lind
Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108

Mr. Dennis Parker
Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108

Mr. Richard Cameron
February 27, 2009
Page 3

cc: Mr. Martin Hausladen
U. S. Environmental Protection Agency
75 Hawthorne Street, U-9-2
San Francisco, California 94105

Mr. Robert Ehe
California Regional Water Quality Control Board
Los Angeles Region
320 West Fourth Street, Suite 200
Los Angeles, California 90013

Mr. Michael Lyons
California Regional Water Quality Control Board
Los Angeles Region
320 West Fourth Street, Suite 200
Los Angeles, California 90013

Mr. Robert Elliott
Department of Toxic Substances Control
Office of Legal Affairs
1001 I Street
Sacramento, California 95812

Dr. John Christopher
Department of Toxic and Substances Control
Human & Ecological Risk Division
8800 Cal Center Drive
Sacramento, CA 95826

Dr. Ning-Wu Chang
Department of Toxic Substances Control
Engineering and Geological Service
5796 Corporate Avenue
Cypress, California 90630

DTSC Comment	Port of Long Beach Response
GENERAL COMMENTS	
<p>1. This document is not correctly titled. It is not a "DRAFT REMEDIAL ACTION PLAN." The Navy completed ROD/RAP for IR 7 with the understanding that DTSC would not concur or sign-off on the document until the Port of Long Beach (POLB) had completed the CEQA requirements. It is assumed that this document is a Remedial Design document so correct the title to reflect that status. It may be appropriate to name it as the Remedial Design and Remedial Action (RD/RA) Work Plan.</p>	<p>The document has been re-titled, as suggested, to read "Remedial Design and Remedial Action (RD/RA) Work Plan."</p>
<p>2. The document consistently draws a comparison between "no action" and "limited action" areas. DTSC does not see the necessity for this comparison and believes it is not accurate. The use of Institutional Controls (ICs) constitutes a remedy and therefore should be compared to other areas that require some thing more than no action. Remove this comparison globally in the document.</p>	<p>The document has been revised and expanded to discuss all AOECs defined in the ROD, regardless of whether they include planned construction activities or Institutional Control (IC) measures to comply with the agreed upon remedial action for the site.</p>
<p>3. The document should make it clear the ICs will be used at all the locations where contamination will remain in place or where contaminated materials will be placed as fill. Requirements in the ICS will include, among others, restrictions on use and activities. Specifically, ICs will be required at the Pier G Slip Fill area where POLB is planning the containment of dredged contaminated sediments as indicated in DTSC comments on the Draft Mitigated Negative Declaration and Application Summary Report, IR Site 7 Dredging Project (July 29, 2008).</p>	<p>As stated in response to Comment #2 (see above), the document has been modified to address this comment by expanding the discussion for planned remedial actions at AOECs that require Institutional Controls to meet the required remedy.</p>
SPECIFIC COMMENTS	
<p>1. Page 3, Section 1.2, bullets - the use of the phrase, "in aerial extent" is incorrect. It is recommended to delete "in areal extent." since the phrase adds nothing to the description of the size of the AOECs.</p>	<p>The text has been edited, as suggested, to address this comment.</p>



DTSC Comment	Port of Long Beach Response
<p>2. Pages 4-5, discussions of alternatives - anywhere there is a plan to place contaminated sediment materials in locations within the port and the areas are described as "off-site" in regards to IR Site 7, the statement is incorrect. DTSC and the POLB discussed this issue in a conference call some time back and DTSC was assured by POLB that the issue could be adequately addressed. Since POLB is choosing to dispose of contaminated sediments at other locations within the port then it is DTSC's position that POLB has included those areas within the definition of "on-site" as areas necessary for the implementation of the response action as defined in the NCP (40 CFR 300.400(e)(1)). Additionally, any discussion about the use of ICs should include use of DTSC's Covenant to Restrict Use of Property, which is independent of any restrictions that might be placed in a deed.</p>	<p>The term "off-site" is used in the document to refer to a placement area that is not part of the IR Site 7 "site". The Pier G slip fill is located within the Port of Long Beach, and is thus part of the larger project site, but is not within the boundaries of the IR Site 7 study area according to the site description presented in the Record of Decision. Section 9.5 of the Record of Decision (ALTERNATIVE 5: REMOVAL AND OFF-SITE (OUTSIDE IR SITE 7) CONTAINMENT OF AOEC SEDIMENTS – DISCHARGE OF DREDGED SEDIMENTS OUTSIDE NAVY MOLE) documents this alternative and provides the rationale for its use within the current report. The Port acknowledges the need for ICs to govern future uses of the Pier G slip fill site, post construction, to minimize the potential for future disturbances.</p>
<p>3. Page 5, 1st bullet, Limited Action - Institutional Controls - this section should also indicate that the restrictions will also restrict disturbance of contamination that is either left in place or placed in other locations for use as fill.</p>	<p>The document has been edited, as suggested, to address this comment.</p>
<p>4. Page 6, last paragraph, 1st sentence reads, "Since AOEC-B, AOEC-E, AOEC-F and AOEC-G were accepted as no action or limited action areas and do not require a formal remedy, these AOECs are not discussed further in this report " - use of ICs is considered a "formal" remedy so this statement is not accurate, please remove it. In addition, areas where ICs will be used should be discussed further since ICs constitute a remedy. This document should provide details on implementation of the ICs as discussed in the ROD/RAP for the site, just as has been done in other RD documents for other ROD/RAPs at the former Long Beach Naval Complex Please include further discussions that are consistent with the IR Site 7 ROD/RAP. Additionally, when ICs are used as the remedy because contamination is remains in place at levels that do not allow for unrestricted use then the requirement for 5-Years Reviews exists. This requirement does not exist for "no action" areas and thus grouping "limited action" areas with "no action" areas is misleading.</p>	<p>The document has been edited, as suggested, to address this comment.</p>



DTSC Comment	Port of Long Beach Response
<p>5. The RDR indicates that Pier G Slip Fill has been previous authorized and permitted for confined disposal of contaminated sediment (Pages 7 and 8). Supporting documents (permit, approved design, etc.) have to be included in this report to demonstrate the integrity of structure (dike, surface cap, drainage, etc.) for the confined disposal area will not be compromised during the life of the containment for the contaminated sediment. It is not clear how Pier G dike construction will be coordinated with the dredging activities, e g, one contractor or different contractors and how POLB will ensure the proposed dike construction sequence would match the disposal sequence.</p>	<p>The revised report includes copies of the supporting documents requested by DTSC. Included are copies of the approved permit for the fill design from the Army Corps of Engineers and draft final design drawings depicting the planned construction of the fill. At this time, the Port intends to combine the West Basin dredging effort with the Pier G fill construction into a single contract managed by the Army Corps of Engineers. Thus, a single contractor will be awarded the entire project and all stages will be carefully coordinated to ensure that placement of the contaminated material occurs at the proper time and location within the fill.</p>
<p>6. Based on the modeling (Section 5.2.7, and figures 5-7 thru 5-9), the predicted total suspended solids (TSS) plume could extend over an area of 300-ft by 300- ft. With the proposed dike (quarry and non-contaminated fill) and the set back needed for the turbidity plume and deposit mount, the remaining locations suitable for dumping of contaminated sediments in Pier G Slip fill area (as discussed in Section 3.1.3) has to be refined in the contract document, so that all the contaminated sediments will be deposited behind the dike (including the non- contaminated fill).</p>	<p>The models that predict suspended sediment dispersion following bottom dump disposal are extremely conservative in nature and do not consider the presence of external structures that might alter transport. In this case, the model assumes that disposal is occurring in an open water scenario and suggests that, without any structures to impede flow, the material could be transported up to 300 feet before settling. The actual dike design and proposed construction process account for this by including a submerged dike which will substantially alter any potential movement of the sediment outside of the fill site. All sediments will be deposited a sufficient distance behind the submerged dike to ensure that none of the material is lost from the fill site. Water quality monitoring will be conducted (a requirement of the Water Board) to ensure that this does not occur. If material resuspension occurs at higher rate than expected, the dredge contractor will be required to alter their construction process to minimize its occurrence be either adjusting the disposal process or employing the use of silt curtains to contain the material. The “clean” material planned for use behind the dike will contain higher sand contents than the West Basin material and will settle much faster than 300 feet, as predicted for the AOEC material. Additional details regarding the model input parameters, model assumptions, and results have been added to the revised report.</p>
<p>7. Similarly, the criteria to raise the containment berm (the dike) as the height of contaminated sediment deposit in Pier G Slip Fill increases should be further refined to prevent contaminated sediment from overflow the dike.</p>	<p>See response to comment #6.</p>
<p>8. It is not clear if silt curtains, as discussed in Section 5.3 and Appendix B, will be used during the dumping process.</p>	<p>See response to comment #6.</p>



DTSC Comment	Port of Long Beach Response
9. The wait time after dredging for confirmation sampling needs to be refined (Section 6.1 and Appendix D).	Confirmational sampling will occur within 24 to 48 hours after dredging has been completed to allow material sufficient time to settle, yet ensure that the results are obtained quick enough to allow for additional dredging, if needed, prior to the contractor leaving the site.
10. Place residual sand cover over dredged areas to reduce the surficial concentrations and achieve SMOs (last bullet, page 43). ICs would be needed for such activity.	Using a thin-layer sand cap as a final remedy for a planned dredge area is an option that the Port may need to consider if dredge residuals become problematic in meeting the required SMOs for the site. Such an activity would not be implemented, however, without significant additional evaluation by the Port, and consultation and approval from DTSC. As such, the Port does not expect these actions to be considered during the current construction phases.
11. Appendix A, Sheet1: AOEC is Area Ecological Concern.	The document has been edited, as suggested.
12. Appendix A, Sheets 25 and 26: Lead based paint and asbestos abatement for Pier 11 demolition has to be in compliance with relevant requirements.	The document has been edited, as suggested.
13. Appendix A: Sheet 27 is missing.	The missing page has been added to the revised document.
14. Appendix B, Section 1.3: The referenced section, figure, and table are not part of this report. Need to make that clear that those section, figure, and table are from the referenced document.	The document has been edited, as suggested.
15. Appendix C, Section 1.2,1: The rationale of 30% difference in light transmittance to collect samples for chemical speciation needs to be included.	The rationale for using a 30% difference in light transmittance was developed over several years by the Los Angeles Regional Water Quality Control Board for use when evaluating potential dredging impacts from contaminated sediments within the Los Angeles region. The issue was researched extensively by members of the Los Angeles Contaminated Sediments Task Force and is a standard requirement for virtually all contaminated sediment dredging projects conducted by the Port of Los Angeles and Port of Long Beach. The same criteria are included in the current WDR issued by the Board for the IR Site 7 project (Order No. R4-2008-0203) which is included in the revised report.



DTSC Comment	Port of Long Beach Response
<p>16. Appendix D, page D-3: Regarding the Confirmatory Sampling Plan, the report chose the acceptable rates for false negative (alpha) and false positive (beta) rates as 10% and 20%, respectively. However, DTSC risk assessors have found that the customary values for alpha and beta are, in fact, 5% and 15%. Therefore, DTSC requests the Port of Long Beach to use these values to calculate the acceptable number of post-remediation samples.</p>	<p>The total number of samples planned for the confirmatory sampling plan has been re-calculated using the recommended alternate error rates of 5% and 15%, as suggested by DTSC.</p>

